2012 ANNUAL WATER LICENCE REPORT

Submitted to the Yukon Water Board

Water Use License QZ96-006

2012 ANNUAL QUARTZ MINING LICENCE REPORT

Submitted to Yukon Government, Energy, Mines and Resources

Yukon Quartz Mining License QML-0001

Prepared by:

Minto Explorations Ltd.

Minto Mine

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EXECUTIVE SUMMARY

This report summarizes monitoring and mining activities at Minto Mine which are relevant to both the Water Use and Quartz Mining Licences during the reporting period of January 1, 2012 through December 31, 2012. For the purposes of the Annual Report, the "Minto Mine" means the operation of a mine at the Minto deposit. The Minto Mine operates under Class 'A' Water Use Licence QZ96-006 (WUL) (including subsequent amendments) and under Yukon Quartz Mining Licence QML-0001 (QML).

During the 2012 reporting period, the Minto Mine was formally in a state of production, and although many of the facilities at the Minto Mine were complete, there was continued operational development of the following structures: dry stack tailings storage facility, Southwest Dump, Minto Area 2 Pit, Area 118 pit, Minto underground development ramp, reclamation overburden dump, and water conveyance structures. Exploration activities continued at the Minto Mine site, with 2012 programs exploring new targets on the property.

Minto Explorations Ltd.'s (Minto) has ensured that activities and conditions required under the WUL and QML took place throughout the 2012 reporting period. Monitoring activities that were completed throughout the reporting period included but not limited to the following tasks: acid-base accounting (ABA) testing, water quality surveillance, stream sediment and benthic monitoring program, engineering inspections of physical works, and physical stability monitoring. Progressive reclamation was initiated on the site in the late summer of 2007 and continued during the 2012 reporting period. This report summarizes and compiles activities related to these programs.

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Acronyms and Abbreviations

ABA	Acid-base accounting
Ag	Silver
Al	Aluminum
AMMP	Adaptive Monitoring and Management Plan
As	Arsenic
Au	Gold
BDL	Below Detection Limit
C	Continuously
Cd	Cadmium
Cr	Chromium
CSGQ	Canadian Sediment Quality Guidelines
Cu	Copper
D	Daily
DDH	Diamond Drill Holes
DSSH	Dry Stack Survey Hub
DSTSF	Dry Stack Tailings Storage Facility
e.g.	Exempli Gratia (For Example)
Eltra	Eltra carbon-sulphur determinizer
EMR	Energy, Mines and Resources
Fe	Iron
GPS	Global Positioning System
i.e.	Id Est (That Is)
IP	Induced Polarization
ISGQ	Interim Sediment Quality Guideline
LES	Lower East Slope
LOM	Life of Mine
LWS	Lower West Slope
M	Monthly
Max	Maximum
MCDS	Minto Creek Detention Structure
Md	Monthly when discharging
Min	Minimum
MMER	Metal Mining Effluent Regulations
Mo	Molybdenum
MSD	Minto South Deposit
MWD	Main Waste Dump
MVFE	Mill Valley Fill Extension
Ni	Nickel
NP/AP	Neutralizing Potential / Acid Potential
NPR	Neutralization Potential Ratio
ORP	Oxidation Reduction Potential
OVB	Overburden
PAG	Potentially Acid Generating
Pb	Lead
PDF	Portable Document Format
pH	Power of Hydrogen
POX	Partial Oxide Ore
Q1, Q2, Q3, Q4	Quarter 1, 2, 3, 4
QA/QC	Quality Assurance and Quality Control
QML	Quartz Mining Licence
RO	Reverse Osmosis

ROD	Reclamation Overburden Dump
Se	Selenium
SOP	Standard Operating Procedure
SRK	SRK Consulting Group
SWD	Southwest Dump
TSL	Tailings surface elevation
TSS	Total Suspended Solids
UES	Upper East Slope
UWS	Upper West Slope
W	Weekly
WL	Water Level
Wnf	Every week from March 15 to freeze up
WSP	Water Storage Pond
WTP	Water Treatment Plant
WQSP	Water Quality Surveillance Program
WUL	Water Use Licence
YG	Yukon Government
Zn	Zinc

Units

^oC	Degrees Celsius
%	Percent
BCM	Bank Cubic Metres
DMT	Dry Metric Tonne
g/t	Grams per Tonne
ha	Hectares
hPa	Hectopascal
k	Kilo
kg/ha	Kilograms per Hectare
km	Kilometres
koz	Kilo Ounces
kt	Kilo Tonnes
L	Litre
m	Metres
M	Million
m^2	Square Metres
m^3	Cubic Metres
mg/L	Milligrams per Litre
mg/m^2	Milligrams per Square Metre
Mlb	Million pounds
mm	Millimeters
Mt	Million Tonnes
m/s	Metres per second
W/m^2	Watt per Square Metre

1 Introduction

This Annual Report has been prepared by Minto Explorations Ltd. (Minto) for the 2012 (January 1 – December 31) reporting period, as required by Type A Water Use Licence (WUL) QZ96-006 and Quartz Mining Licence (QML) QML-0001. Specific requirements for the Annual Report are summarized in Table 1-1.

Table 1-1: 2012 reporting requirements as per WUL and QML.

Licence	Section	Clause	Requirement
WUL QZ96-006			
	6		Summary of the review of the *Spill Contingency Plan* include any changes needed.
	8		Summary list of all spills for 2012.
	18	a	Summary of all data generated as a result of the monitoring requirements of the WUL, including analysis and interpretation by a qualified individual of firm and a discussion of any variance from base line conditions, from previous year's data, or from expected performance.
		b	A detailed record of any major maintenance work carried out on any physical works where that maintenance may have a direct or indirect impact on water quality or water quantity, either as a result of the maintenance activity itself or as a result of the changed operation or performance of the physical works following the completion of the maintenance activity.
		c	Updated descriptions and UTM coordinates for the surveillance monitoring sites listed in Appendix 1 of this licence.
		d	details of results, including data collected during freshet for the Yukon River Monitoring Program.
		e	Detailed data on the volume of water used during the year including water withdrawal from each water source, water routed around and through the site as part of the water conveyance system, water diverted around the site, water routed for storage in the pits, water deposited with mine wastes in waste storage facilities, water routed to the Water Storage Pond, water routed to the treatment plant and water discharged to Minto Creek.
		f	Details of results, including data collected, for the Groundwater Monitoring Program.
		g	Details of the review of the AMMP, including the resulting updated AMMP.
		h	Detailed data on tailings deposition in the Main Pit and Area 2 Pit, including volume and tonnage of tailings slurry deposited, cumulative volume of tailings solids stored in the pits, tailings solids surface elevation and pit water elevation.
		i	Details of results, including data collected, for the Seepage Monitoring Program;
		j	Details and findings of the Physical Monitoring Program, including monitoring of the DSTSF.
		k	Details of the review of the water balance/water quality model, including the resulting updated water model and results.
		l	Results and interpretations of the QA/QC Program.
		m	Meteorological data compiled, including evaporation and evapo-transpiration data.
		n	Results of the Annual Biological Monitoring Program.
		o	Results of the MCDS Seepage Monitoring Program.
		p	Any other reports which are required by this licence.
	28		Results and interpretations of the QA/QC Program.
	77		Seepage monitoring results report.
	78		Updated water balance and water quality model as submit the updated model as part of the Annual Report.

Licence	Section	Clause	Requirement
		a	Updated model input parameters based on the most current climatic, environmental and operational conditions and data.
		b	An update of the basic climatic input parameters and the frequency analysis for the regional stations based on current climatic data.
		c	Technical information deficiencies that are identified in Water Use Register QZ09-094, exhibit 5.4, Appendix A.
	79		Meteorological data compiled, including evaporation and evapo-transpiration data and snow pack.
	82	e	The Annual Report for each year shall include a list of each of the annual physical inspection recommendations and an explanation of how each recommendation has been addressed.
	85		Results of the MCDS seepage program for the Annual Report.
	86		Annual Biological Monitoring Report.
	89		Results from the full depth dry stack tailings samples.
	93		Review and update the AMMP.
	95		Results of the waste rock management verification program.
		a	Detailed records on the types and quantity of waste rock placed at each location.
		b	Monitoring and verification of the characteristics of the waste rock in accordance with the grades required by Clause 43 of this licence, stored at each location.
	97		Results of the *Groundwater Monitoring Plan*
QML-0001			
	12	5	Annual Report
QML-0001			Letter from EMR May 24, 2011 detailing Annual Report Requirements
	L	a	A summary of construction activities associated with the Undertaking;
		b	A summary of mining activities;
		c	A map showing the status of all structures, works, and installations associated with the Undertaking;
		d	The total amount of ore and waste removed from the underground workings and open pits;
		e	The total amount and the average head grade of ore milled;
		f	The total amount and the average grade of each ore stockpiled;
		g	The remaining reserve life of the mine;
		h	Any temporary closure or permanent closure that has occurred during the year;
		i	The total amount of concentrate produced and removed from the Undertaking;
		j	The total amount of tailings deposited in the tailings facilities;
		k	The total amount of waste rock removed from the mine and its deposit location;
		l	The total amount of waste rock stored in each waste rock storage facility;
		m	As-built drawings of the open pit and underground mines and of all engineered structures, works, and installations constructed or altered at the Undertaking during the year;
		n	Details respecting any action taken as a result of the recommendations made by the engineer in relation to the inspection referred to in 12.1 of QML-0001;
		o	A summary of any updates to estimates of ore reserves and the life of the mine, including reserve category, tonnage and grade;
		p	A summary of any underground stability incidents;
		q	A summary of the programs undertaken for environmental monitoring and surveillance as outlined in the *Environmental Monitoring Plan* and the *Wildlife Protection Plan*, including an analysis of these data and any action taken or adaptive management strategies implemented to monitor or address any changes in environmental performance;

Licence	Section	Clause	Requirement
		r	A summary of progressive and ongoing reclamation activities;
		s	A summary of proposed development and production and reclamation activities for the coming year;
		t	A summary of activities related to care and maintenance of the Undertaking, including any temporary closure activities, if applicable;
		u	A summary of spills and accidents that occurred at the Undertaking;
		v	A summary of the level of traffic, access control issues, wildlife incidents and other accidents, and any upgrade or maintenance work planned for the upcoming year.
QML-0001			
	4		As-built drawings of the Mill Valley Fill, stamped by a professional engineer, licensed to practice in the Yukon.

This report provides a summary of activities at Minto Mine for the reporting year, including but not limited to: production summaries, environmental monitoring studies, physical stability monitoring, progressive reclamation, water management and construction activities.

An aerial photo taken in August 2012 with site infrastructure labeled is presented in Figure 1-1, and site conditions at the end of the reporting period are presented in Figure 1-2,

Figure 1-1: Site overview as of August 2012 (scale: 1:10000).

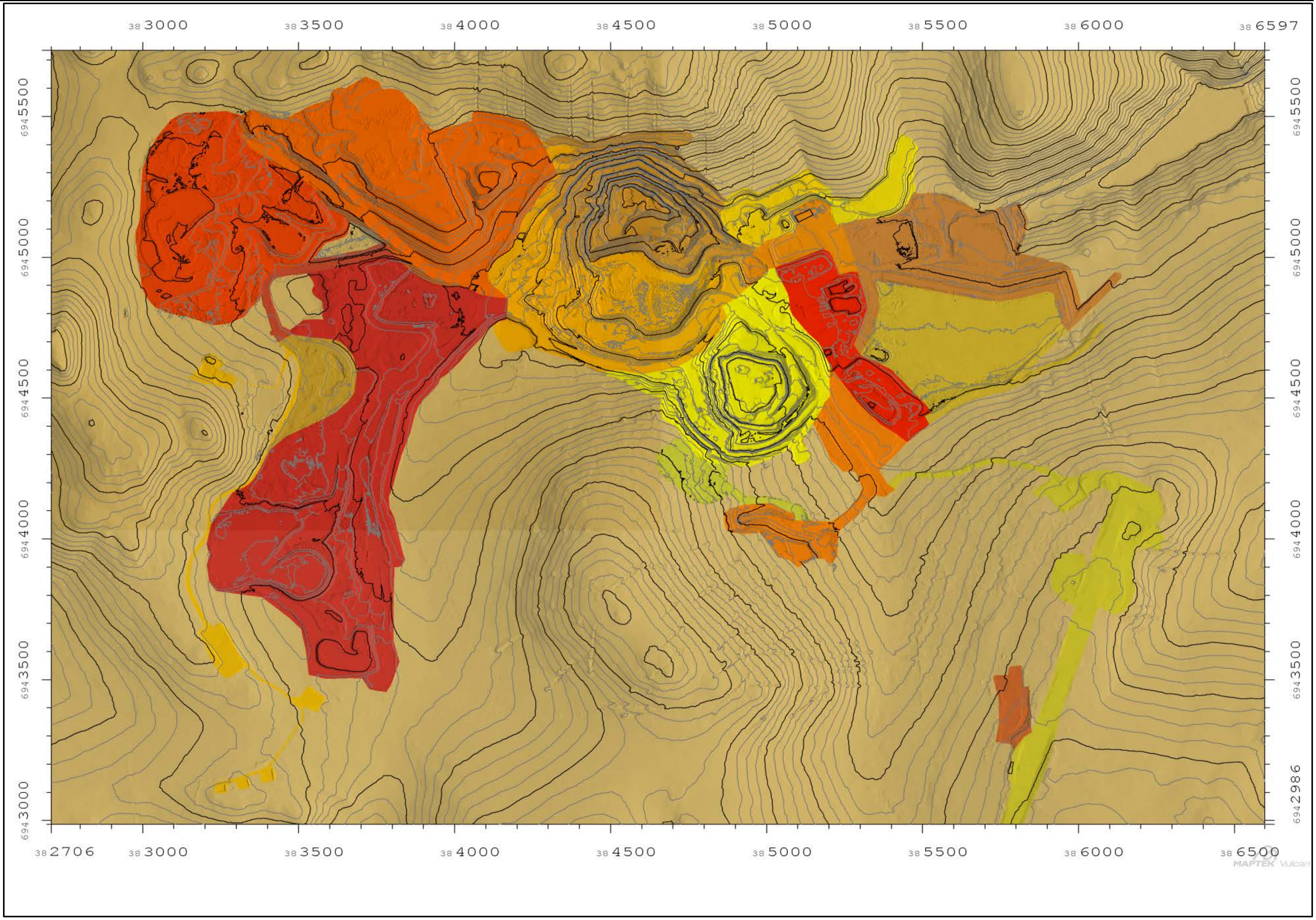

Figure 1-2: General site layout – December 31, 2012.

2 2012 Site Activities

Minto Mine remained operational through 2012, producing 35.9 million pounds (Mlb) of copper from the milling of 1.34 million tonnes Mt of ore. Mining for the year totaled 4.25 M bank cubic meters (BCM).

General site activities included exploration drilling, mining of both pits (Area 2 and Area 118) assessed as part of Phase IV, mining of the underground development assessed in Phase IV, milling ore stockpiled from previous mining as well as that released by Area 2, deposition of tailings in the dry stack tailings storage facility (DSTSF), deposition of tailings into the completed Main Pit as per the *Phase IV Tailings Management Plan*, hauling of waste to various waste rock dumps as per the *Waste Rock and Overburden Management Plan*, and maintenance and repair work on various structures around the mine site such as access roads.

2.1 Exploration Program

Exploration activities are authorized under Mining Land Use Permit LQ-00264. A 4 month exploration drill program was executed at the Minto property during the 2012 reporting period between January 29 and May 24. During that period, 84 diamond drill holes (an aggregate of 29,539 meters) were drilled. Exploration activities focused on the Fireweed A and B discoveries, Minto South Deposit (MSD), MSD Gap, Ridgetop deposit and Ridgetop West area, and the Inferno Prospect. As well, a number of previously untested Titan 24 3D-IP (Induced Polarization) targets on the property were also drill tested.

2.2 Mining Activities

2.2.1 Open Pit Mining

2012 began with mining activities continuing in Area 2 Pit; no significant release of ore was seen in the first quarter of the year; small amounts of low-grade and partially oxidized ore were stockpiled separately from the Main Pit ore being processed by the mill. Dump development continued as per the *Waste Rock and Overburden Management Plan*, with mid- and high-grade waste types deposited to dedicated areas of the Southwest Dump or in the Main Pit Buttress beneath the final spill elevation of the Main Pit. Low-grade waste was routed to the Main Pit Buttress, and zero-grade waste routed the Mill Valley Fill Extension (MVFE). In November 2011, a rate increase in the movement of the Dry Stack Tailings Storage Facility (DSTSF) was observed, for this reason, in mid-February, Minto began constructing the MVFE out of waste rock meeting the mine's construction-grade criteria (less than 0.10% Copper) to expedite the completion of the facility.

The first major release of high-grade sulfide ore from Area 2 occurred in April. The second quarter of the year saw continued advancement of the Area 2 Pit and processing of released ore.

In the third quarter, mining continued to focus on advancing the depth of the Area 2 Pit; in addition, stripping began on the "Stage 2" pushback of Area 2 Pit's west wall. Construction of the Main Pit Buttress was halted on September 1, as the buttress design reached the Main Pit's final spill elevation, and the MVFE was judged a higher-priority destination for waste rock meeting the construction-grade criteria. Earlier in the year, Minto's Acid-Base Accounting (ABA) program identified a number of samples with Neutralization Potential Ratio (NPR) of less than 3. Minto responded to this by commissioning an on-site carbon / sulfur analysis laboratory and running all pit blasthole samples through it: on August 17, segregation of material with an NPR <3 began, with deposition occurring below the final spill elevation of the Main Pit. For more details on the carbon sulphur analysis laboratory see Section 5.12.

During the fourth quarter some geotechnical instability of the Area 2 Pit intermediate Stage 1 highwall was encountered; this necessitated a shift in focus to Stage 2 and a deferral of ore release into 2013. The Stage 1 highwall instability was caused by a persistent shear feature that approximately paralleled the orientation of the Area 2 Pit's west wall. This plane of weakness, exacerbated by blast damage, resulted in a loss of catchments along a portion of the wall. By the end of the quarter, Minto had begun using real-time radar based slope monitoring to ensure the safety of its workforce, redesigned the Area 2 Pit to provide additional catchment width, redesigned the access ramp such that it was not routed beneath the west highwall, and implemented revised blasting procedures to control blast-induced wall damage.

A small amount of overburden stripping was also done on the Area 118 pit.

On November 1, after a water licence approval was received, a tailings line was installed and deposition of slurry tailings began into the Main Pit; with this, placement of tailings on to the Dry Stack Tailings Storage Facility (DSTSF) ceased. The placement of a 'starter' cover on the DSTSF, using overburden from Area 118 pre-strip, began in December.

Figure 2-1 contains as-built drawing for the Area 2 Pit development as of December 31, 2012.

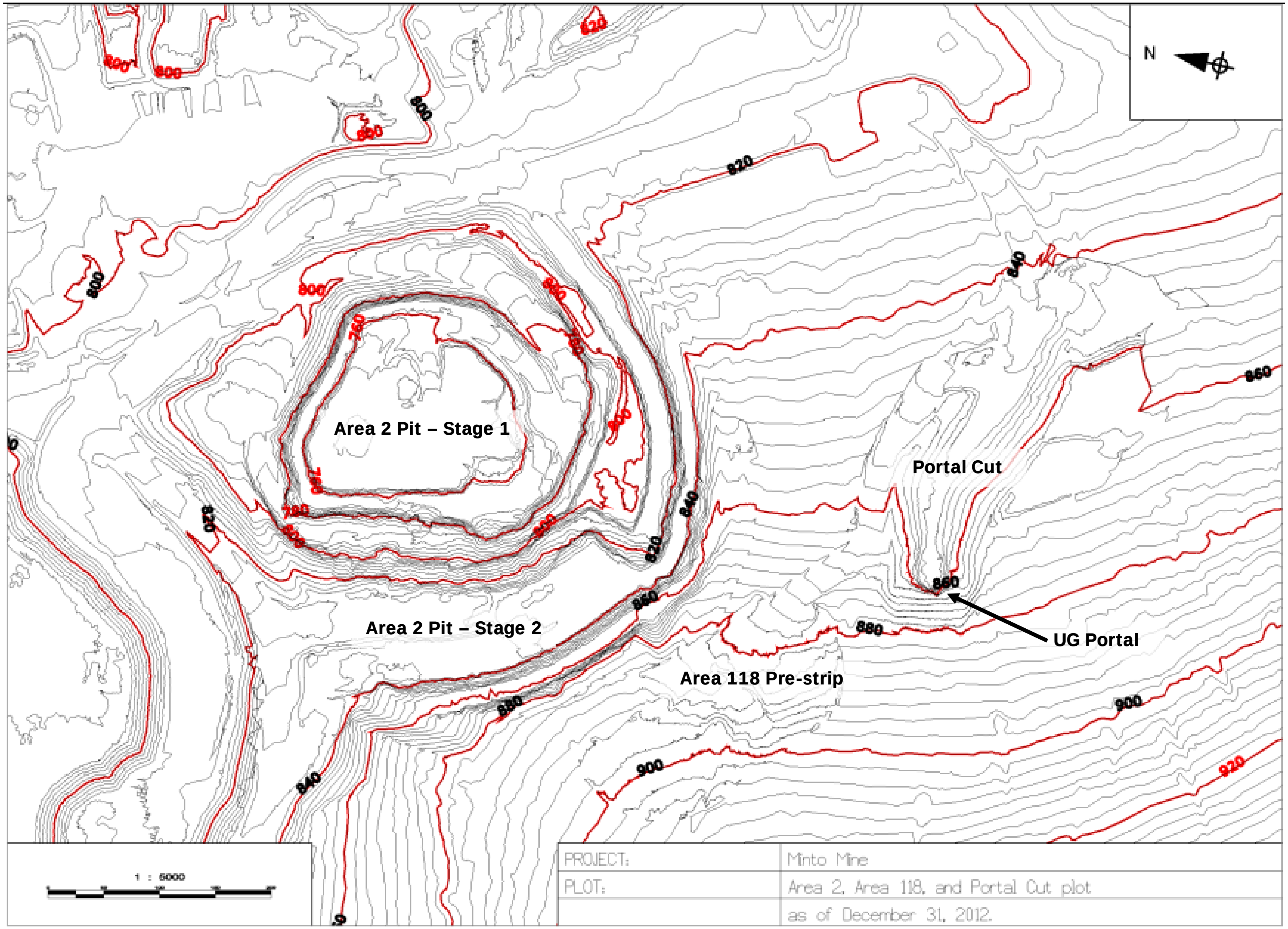

Figure 2-1: Area 2, Area 118 and portal cut as-built drawing.

2.2.2 Underground Project

Minto Mine is currently permitted for Phase IV development which began with 500 m of development ramp. The total scope of Phase IV with respect to underground activities was to enable development of Area 118 and Area 2 based on approval of the *Underground Mine Development Operations Plan* (submitted in early 2013). The first quarter saw no mining or development; however, preparations were made to commence underground mining.

In the second quarter Minto Mine awarded Dumas Mining the contract for developing the initial 500 m ramp as permitted by QML-0001. The second quarter saw no mining underground; however, plans were developed further, which included the portal location change to the originally assessed location outside of the Area 2 Pit.

In the third quarter, the underground development plan was revised to optimize development. The size of the ramp (5 m by 5 m at -15% slope) was selected according to the mobile equipment size, required clearances, and ventilation requirements during development and production. A 25 m or greater ramp curve radius was planned for ease of operation of the large mobile equipment; additionally, the ramp curve radius was selected to reduce maintenance costs. Three explosive magazines were purchased and installed, to be used for underground explosives.

Clearing of overburden at the portal location and access road construction began late July, and the first blast to establish the portal occurred in early September. . The first blast into the portal occurred on Sept. 14th; and was immediately followed by a failure in the south side of the portal face. Development was delayed as the geotechnical stability was investigated. The portal face was secured and a mine engineering consultant (Itasca Consulting) was brought to site to consider a more detailed ground support program. The ground support program recommended the installation of 2.4 m fully grouted resin rebar bolts on the back and the walls of the ramp on 1.2 m by 1.2 m pattern, 100% mesh coverage and an allowance of 50 millimeters (mm) of shotcrete for 5% of the total length of the ramp.

The portal entrance was collared (15 m), the steel portal access structure was installed and tight lined. Due to winter weather conditions, the shotcreting at the portal was delayed until spring 2013.

In the fourth quarter, installation of services – temporary power, heat, ventilation, propane, and clean and temporary dirty water returns were installed and commissioned. Dumas begin driving the ramp in late November at a slope of –15%. Revised Life of Mine (LOM) drawings were completed to ensure operations would be able to meet their 2013 production commitment. The location of the fresh air raise and return air raise were revised to meet egress requirements during the production phase. A total of 2913 BCM of waste and 437 BCM of mineralized material were removed from the underground development in 2012.

Figure 2-2 is an overview of the infrastructure outside of the portal. Figure 2-3 contains the as-built drawings for the portal development as of March 4, 2013; portal advancement for 2012 occurred between the electrical substation cut out and the dirty water storage cut out.

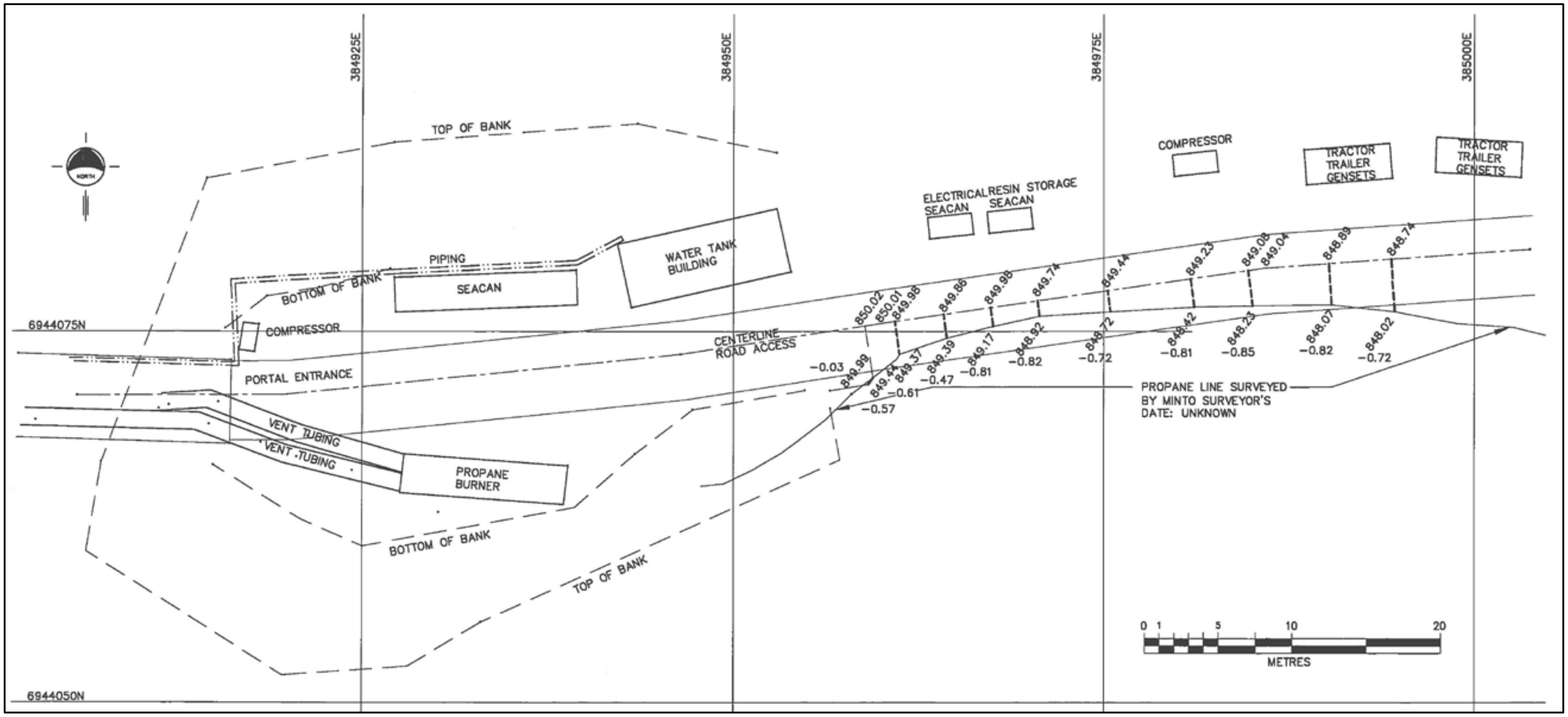

Figure 2-2: As-built drawing of the infrastructure outside of the portal entrance.

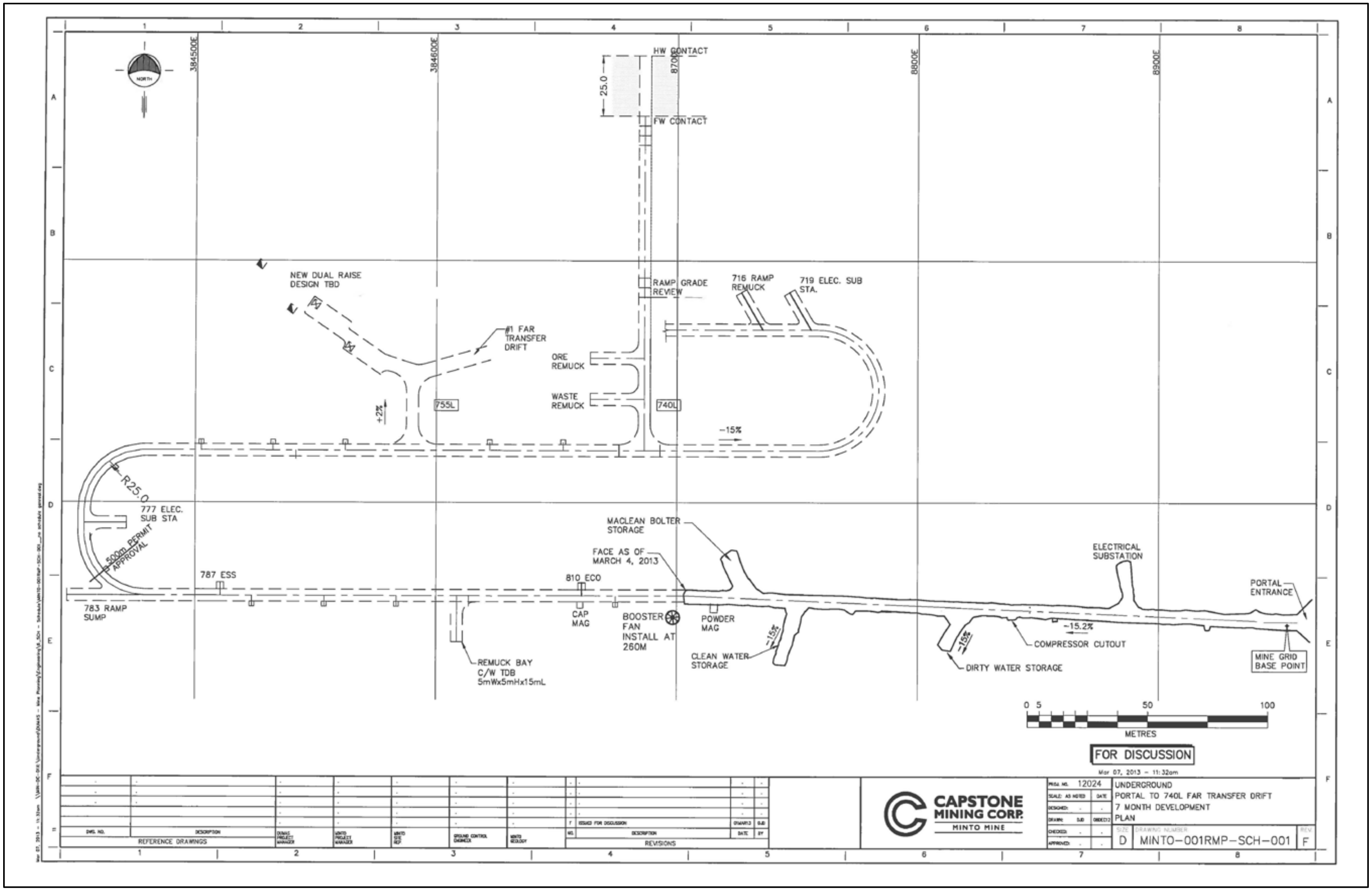

Figure 2-3 : As-built drawing of the development to March 2013.

2.2.3 Mill Valley Fill Extension

The Mill Valley Fill Extension (MVFE) was designed to reduce ongoing creep movement observed within the DSTSF towards the Minto Creek valley.

At the start of 2012 construction of the MVFE continued using zero-grade waste rock; however, the rate of construction rate was limited by the small quantity of suitable material released from Area 2 Pit. The movement rate of the DSTSF increased substantially in November of 2011, prompting Minto to engage the Yukon Government - Energy, Mines and Resources (EMR) in discussions regarding the progress of the MVFE. As a result of the discussions, in mid-February, Minto began constructing the MVFE out of waste rock that met the mine's construction-grade criteria. Minto ensured that material that had a high potential for contact with water (i.e. the drainage layer of the MVFE) was constructed from material with a zero-grade copper content as defined by the *Waste Rock and Overburden Management Plan*.

As of December 31, 2012, the MVFE was approximately 97% complete, with only final grading and infill of an access road remaining to be completed. An as-built drawing of the MVFE as of year-end is shown in Figure 2-4.

The MVFE has substantially reduced the movement rates seen on the DSTSF; current data is summarized and provided in Section 7.1 and further details can be found in the *Dry Stack Tailings Storage Facility Deformation Monitoring Plan* which was submitted to the Yukon Water Board on November 12, 2012. A thorough geotechnical investigation is [planned for 2013 to investigate the movement rates of the DSTSF and determine if an increased MVFE will be required. If this was the case, design would be subject to regulatory approvals before construction.

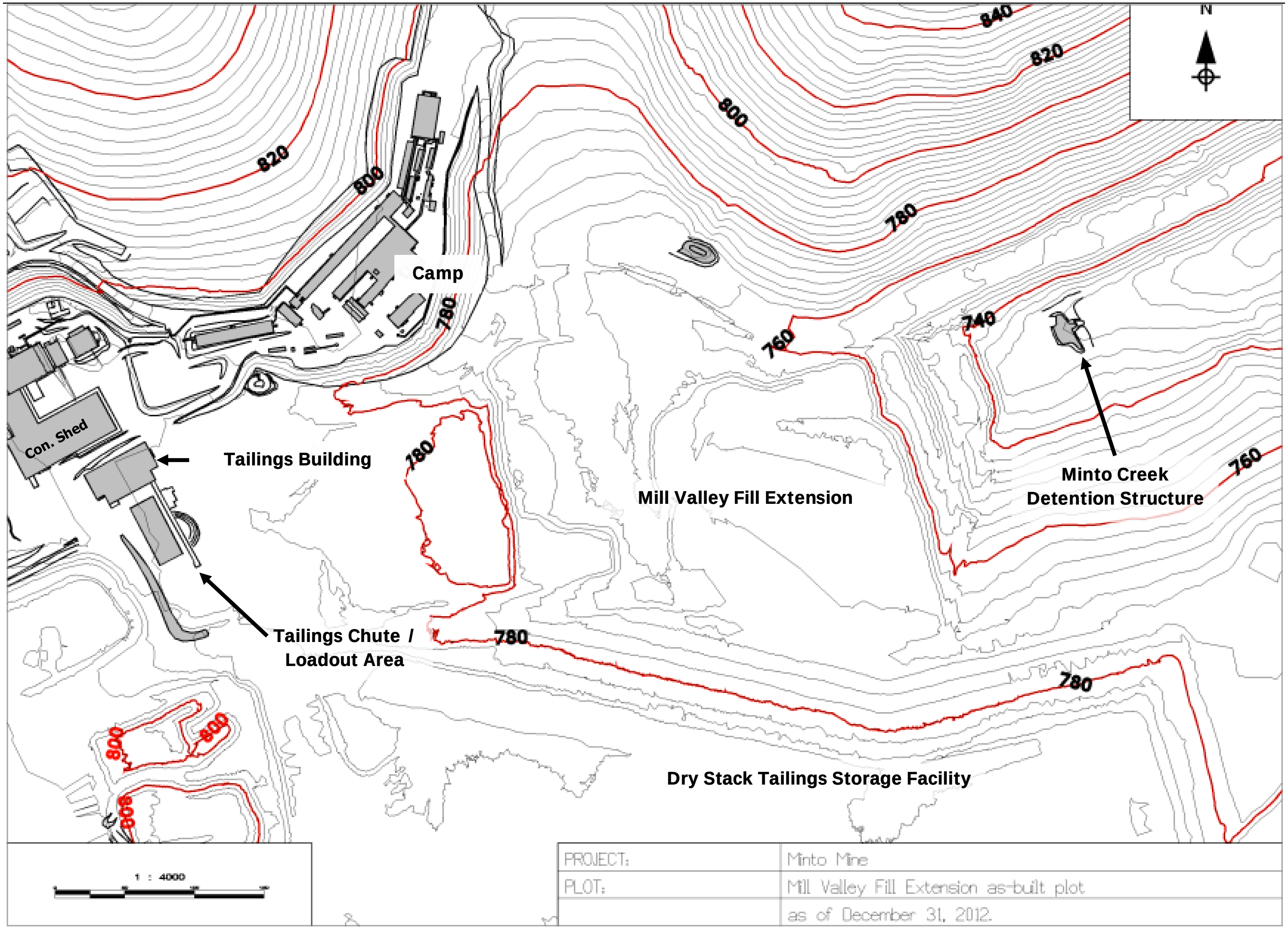

Figure 2-4: As-built drawing of the Mill Valley Fill Extension construction as of December 31, 2012.

2.2.4 Main Pit Buttress Construction

At the start of 2012, the buttress covering the south wall of the Main Pit was completed up to the 768 m elevation. In 2012, 1.40 M cubic meters (m^3) of waste rock was placed on the buttress, bringing it up to the 786 m elevation and then almost completely covering what remained of the exposed overburden slope. The buttress construction has resulted in a significant decrease in movement rates, including, in some places, the complete cessation of movement. Further details were submitted to the Yukon Water Board (YWB) and copied to EMR as part of the *Mine Waste Structures Deformation Monitoring Plan and Report*. Additional details can be found in Section 7.1 Physical Monitoring Program in this report. Figure 2-5 displays the as-built of the Main Pit Buttress to the end of 2012.

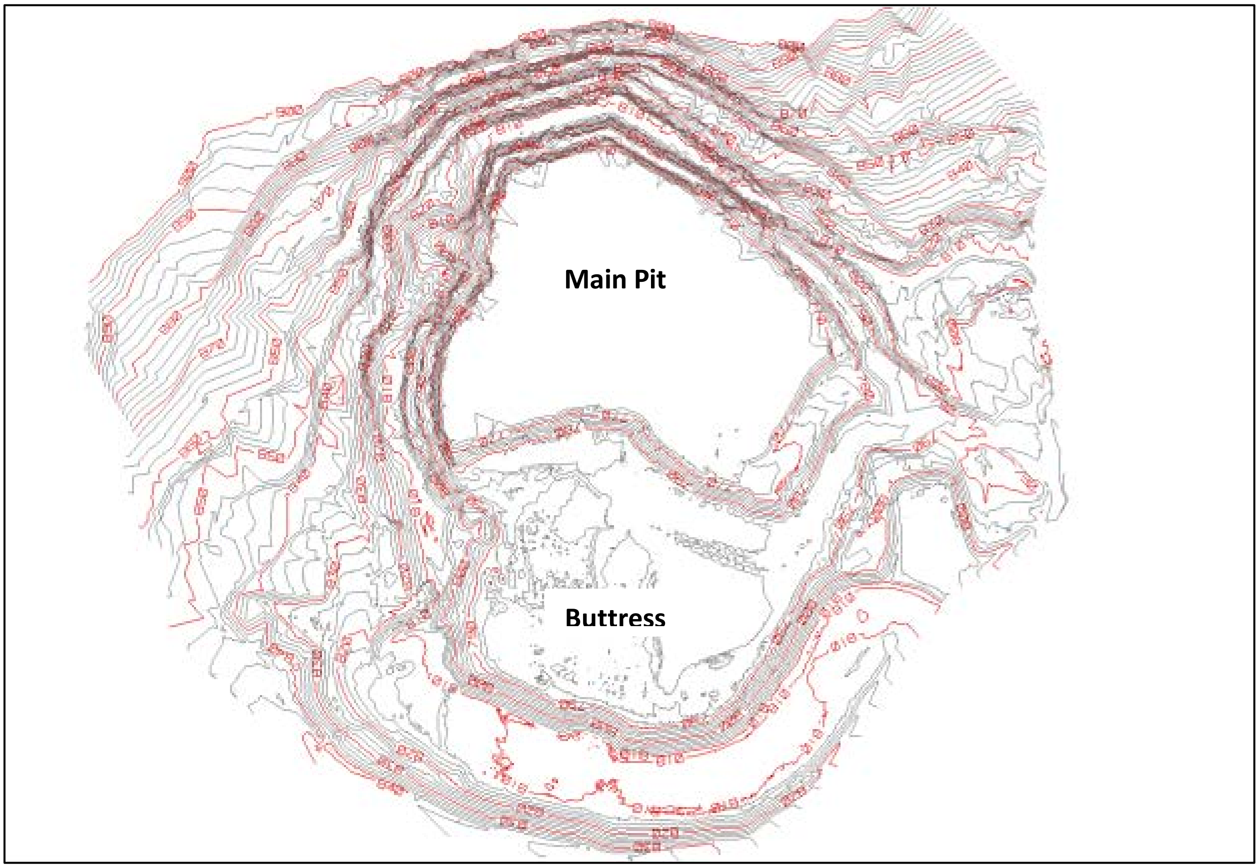

Figure 2-5: As-built drawing of the Main Pit Buttress – December 31, 2012.

2.2.5 Waste Rock Management

Waste rock and overburden were deposited in the following dumps:

Southwest Dump: In 2012, the Southwest Dump received only mid- and high-grade waste, as per Minto's *Waste Rock and Overburden Management Plan*. Placement of material in the low-grade areas of the dump did not occur, as the MVFE and Main Pit Buttress received all low-grade waste throughout the year.

Reclamation overburden dump extension: this dump remained the primary destination for overburden material excavated in the course of mining, aside from a small quantity of overburden taken from Area

118 pre-stripping that was deposited onto the completed DSTSF to serve as a starter cover. Some overburden was hauled to the Main Waste Dump to complete reclamation of its south and west slopes. Progressive reclamation is described in more detail in Section 8 of this report.

Ice-rich overburden dump: No significant sources of ice rich overburden were encountered in 2012, therefore no material was placed in the Ice-rich overburden dump.

Waste material was also placed at the Main Pit Buttress and MVFE, as described in the Sections 2.2.4 and 2.2.5

In 2012, the total volume of waste material excavated and placed was 3.91M BCM. The placement of the mined material is summarized in Table 2-1. "Other projects" includes construction projects, in-pit ramps, road work, stockpile pads, and rockfill roads on the DSTSF. A layout of various dumps on the project site can be found in Figure 1-2.

Table 2-1: Waste material mined and volumes of waste rock dumps.

Dump Location	Quantity Dumped (BCM)	Quantity Stored as of December 31, 2012 (m^3)
Main Pit Buttress*	1,077,000	2,648,000
Mill Valley Fill Extension**	756,000	1,395,000
Southwest Dump - Mid-grade Waste Area	714,000	8,850,000
Southwest Dump - High-grade Waste Area	88,000	
Southwest Dump – Low-grade Waste Area	0	
Reclamation Overburden Dump	818,000	4,254,000
Main Waste Dump***	22,000	8,149,000
DSTSF – Berm	96,000	n/a
DSTSF – Rockfill Roads	77,000	n/a
Portal Access Road and Laydown Pads	81,000	n/a
Other Projects and Roadwork	181,000	n/a
Total Waste Dumped	**3,910,000**	**25,296,000**

*Includes PAG material placed beneath the spill elevation of the Main Pit in an extension of the buttress design.
**Includes Mill Valley Laydown Pad.
***All dumping took place as part of reclamation activities.

2.2.6 Tailings Management

Tailings deposition to the DSTSF was completed on October 31, 2012. In total, 1.10 Mt of tailings was deposited over the year to the DSTSF.

Clause 89 of the WUL requires the completion of full-depth sampling of the DSTSF and the inclusion of the results in the Annual Report. This work is scheduled to take place in March of 2013 and is therefore not available for inclusion in this report.

In November and December, Minto deposited approximately 196,000 t of tailings into the Main Pit. The estimation of tailings solids surface elevation required by Clause 18(h) of the WUL has not been provided as the survey for the Main Pit pond bathymetry could not occur during the winter months. The initial bathymetric survey will be completed in summer of 2013. Pit water elevation as of November 1, 2012 was 762.9 m, implying water storage of 1.76 Mm^3. By December 31, 2012 the pit water level had risen to 765.1 m, for a combined tailings / water volume of 1.95 Mm^3. The total capacity of the Main Pit is 4.23 Mm^3; note that all volumes include water storage within the pore spaces of the Main Pit Buttress rockfill.

2.2.7 Ore Stockpiles

Minto's operation includes the use of stockpiles to ensure steady operation of the mill. During the first three months of 2012, as in the preceding eight months, all ore was sourced from stockpiles. In April of 2012, Area 2 began releasing sulfide ore and processing of this ore began shortly thereafter.

Stockpiled ore is segregated based on grade, and the tonnage of each ore type is tracked on a monthly basis. Table 2-2 lists the total inventory on-site as of December 31, 2012.

Table 2-2: Ore stockpile volumes as of December 31, 2012.

Ore Stockpile	Mass (tonnes)	Copper (%)
Red	219	5.30
Yellow	0	0.00
Green	3,724	1.44
Blue	334,816	0.76
Partial Oxide Ore (POX)	234,249	1.29
Low Grade POX	31,250	0.70
Live Pile	12,602	1.12
Total Ore	616,860	0.97

2.2.8 Operating Results

Key operating results at Minto Mine in the 2012 reporting year are outlined in Table 2-3.

Table 2-3: 2012 operating results.

Metal Production	Quantity
- Copper (000s pounds)	35,928
- Silver (ounces)	183,536
- Gold (ounces)	18,599
Ore Mined	
- Tonnes of ore mined	942,739
Ore Milled	
- Tonnes of ore processed	1,341,584
- Copper grade (%)	1.34
- Silver grade (g/t)*	5.06
- Gold grade (g/t)	0.58
Recoveries	
- Copper (%)	90.5

Recoveries	
- Silver (%)	84.1
- Gold (%)	74.0
Concentrates Produced	
Copper concentrate (dmt)**	43,423
Copper (%)	37.5
Silver (g/t)	131.5
Gold (g/t)	13.3
*g/t = grams per tonne **dmt = dry metric tonne	

2.2.9 Concentrate Shipments

In 2012, a total of 47,238 wet metric tonnes of concentrate was shipped from the mine site. The concentrate had a moisture content of 8.6% giving it a dry metric tonne weight of 43,166 dmt. The concentrate on average had a copper content of 37.1%, a gold grade of 12.7 grams per tonne and a silver grade of 130.8 grams per tonne.

2.3 Mine Access Road

Access to the mine is via a 27 km access road; the North Klondike Highway is used to gain access to the road. From the North Klondike Highway, the mine access road passes through Minto Landing and across the Yukon River. In the winter months, the mine access road Yukon River crossing is accomplished by an ice bridge and in the summer months, a tug and barge are used. The mine access road is controlled by gate access on the east side of the crossing during winter months; traffic is monitored by way of traffic logs kept by ice bridge/barge attendants who also supply safety information to truck operators.

2.3.1 Traffic

In 2012, access across the Yukon River was over an ice bridge from January 1 until April 16; during that period roughly 680 light and 1160 heavy vehicles travelled across the ice bridge. There was no land access to the mine site from April 16 until June 4, 2012 when the summer tug and barge operation commenced. During the barge operation, 1335 light and 2415 heavy vehicles accessed the Minto Mine via the mine access road. Ice bridge construction was completed in December 15, 2012, and only limited light vehicles passing until the end of the 2012.

2.3.2 Access Control Issues

There were no access control issues as outlined by the QML in 2012.

2.4 Accidents and Incidents

2.4.1 Incidents

In 2012, seven lost time accidents occurred with Minto Mine employees and their contractors.

Serious incidents and near misses were reported to: the Yukon Workers' Compensation Health and Safety Board; EMR; Selkirk First Nation; and other authorities as required, depending on the type of incident.

2.4.2 Wildlife Incidents

There was only one incident involving wildlife in 2012 occurring on June 24th, when a black bear entered a camp building. The black bear was scared off using non-lethal techniques. The Conservation Officer was notified and an investigation was completed.

2.4.3 Reportable Spills

In 2012, six reportable spills occurred at Minto Mine. Table 2-4, below, summarizes the reportable spills for 2012.

Table 2-4: 2012 reportable spill summary.

Date of Incident	Volume (L)	Substance	Cause
31-May-12	30	Assay waste acid	Acid sump at the assay laboratory overflowed.
11-Jun-12	177	Diesel	Crossover brackets on fuel tank hooked to barge apron causing a puncture in the fuel tank of a concentrate truck.
24-Jun-12	11	Sodium Sulphide	Super sack of Sodium Sulphide fell off of pallet while being moved causing a tear in the bag and spill of Sodium Sulphide.
13-Jul-12	4	Dry Chemical Extinguisher	Suburban caught fire, employee tried to contain fire by using fire extinguisher.
10-Aug-12	45	Antifreeze	The tip of one fan blade broke off causing it to go through the top of the radiator which caused a radiator leak.
04-Dec-12	300	Lube Oil	Cold, hard O-Rings were not tightened and when warmed up began to leak

The spills in Table 2-4 were reported and cleaned up as per the *Spills Regulations* of the Yukon Environment Act. Additionally, non-reportable spills were tracked internally and cleaned up as per the *Spills Regulations.*

2.4.4 Spill Contingency Plan Review

It is a requirement to review the *Minto Mine Spill Contingency Plan* yearly as part of the Annual Report. This year's review can be found in Appendix A.

3 Proposed Mining for 2013

3.1 Proposed Open Pit Mining for 2013

In 2013, it is expected that Stage 2 of the Area 2 Pit will be completed and that mining will move to Area 118, which will continue to early 2014. The mining rate is budgeted at approximately 12,800 BCM/day. Additional surface mining beyond Area 118 will require the assessment and licensing of the Phase V/VI expansion.

3.2 Proposed Underground Mining for 2013

In 2013, Minto Mine intends to continue developing access to Area 118 and Area 2 underground ore zones. Development for the period is planned for 1371 m of ramp development, 1705 m of level and stope access development, and 204 m of vertical development. Ore tonnes for the year is planned to be approximately 214,600 t with 80,000 to 100,000 t of development ore from sill drifting prior to production stoping. The second egress will be established prior to stoping.

Minto Mine is awaiting approval of the *Underground Mine Development Operation Plan* from EMR before continuing the Phase IV development beyond 500 m.

Figure 3-1 illustrates the LOM drawings for development and stoping.

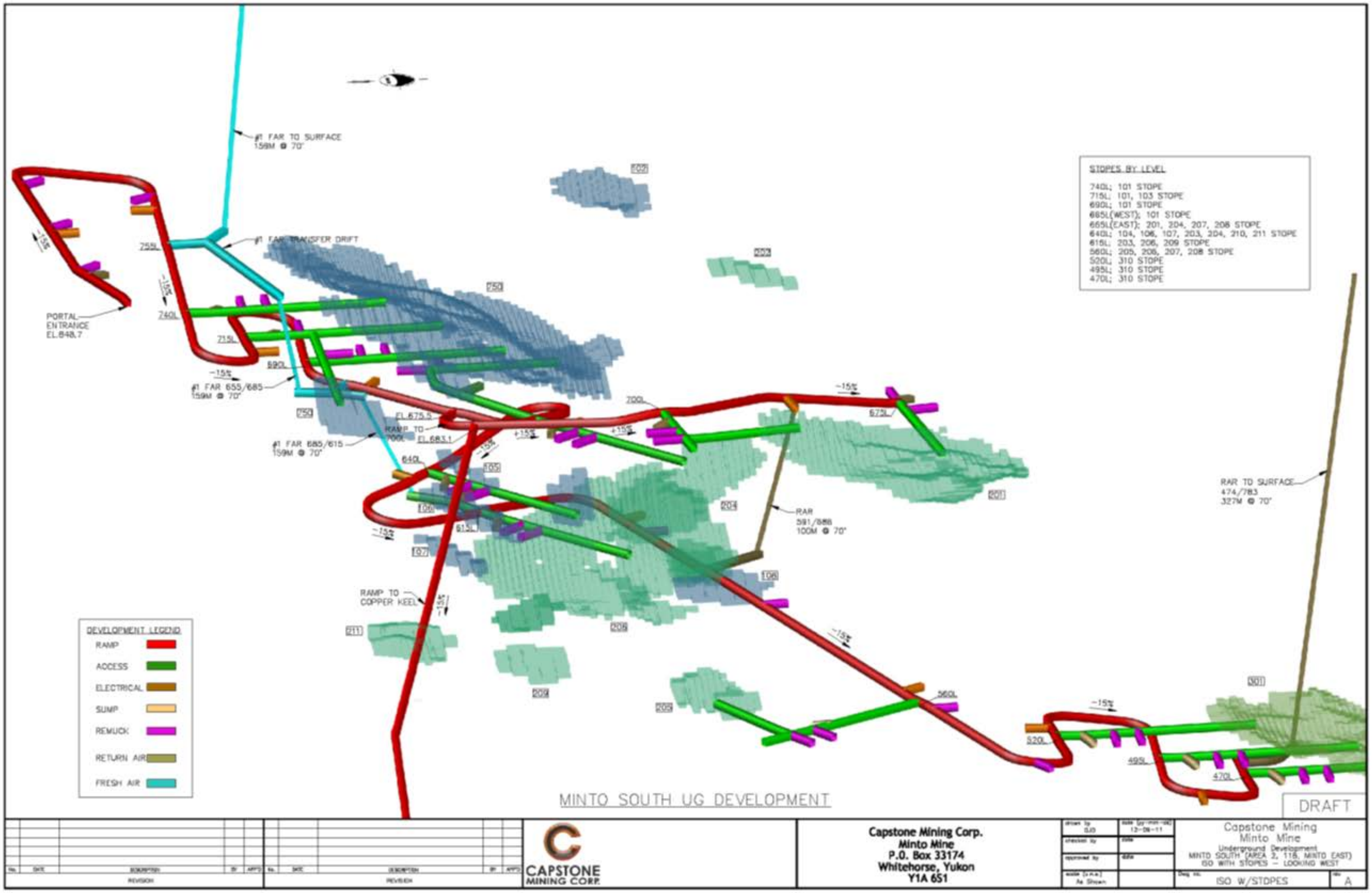

Figure 3-1: LOM drawing for stope development.

4 Mineral Reserves

Reserves for the Area 2 Pit are calculated between the 2012 year-end surface, free of any fill, and the current pit design. Mining of ore has not yet begun in any other pits or in the underground stopes; therefore, their reserves are taken from Minto's Phase VI Pre-Feasibility Study, which is a public document available for download. Table 4-1 summarizes the open pit mineral reserve and Table 4-2 summarizes the underground mineral reserves. It is important to note that Phase V/VI has not completed the assessment phase and is not currently permitted.

Table 4-1: Open pit mineral reserves.

			Ore (kt)*	Cu (%)	Au (g/t)	Ag (g/t)	Cu (Mlb)	Au (koz)**	Ag (koz)
Phase IV	**Area 2 (to Stage 2)**	**Proven**	2,467	1.44	0.54	4.78	79	43	379
		Probable	251	0.90	0.27	2.98	5	2	24
		Sub-total	2,719	1.39	0.52	4.61	84	45	403
	Area 118	**Proven**	-	-	-	-	-	-	-
		Probable	483	1.28	0.1	1.81	14	2	28
		Sub-total	483	1.28	0.1	1.81	14	2	28
Phase V/VI	**Minto North**	**Proven**	1,596	2.26	1.21	8.12	79	62	417
		Probable	9	1.68	0.58	6.92	0	0	2
		Sub-total	1,604	2.26	1.21	8.12	80	62	419
	Area 2 Stage 3	**Proven**	26	0.93	0.23	1.66	1	0	1
		Probable	838	0.99	0.26	2.84	18	7	76
		Sub-total	864	0.99	0.26	2.80	19	7	78
	Ridgetop	**Proven**	1,073	1.02	0.25	2.12	24	9	73
		Probable	1,020	1	0.28	2.97	22	9	97
		Sub-total	2,093	1.01	0.26	2.54	46	18	171
	Open Pit Total	**Proven**	5,162	1.60	0.69	5.24	183	114	870
		Probable	2,601	1.04	0.24	2.73	59	20	227
		Sub-total	7,763	1.42	0.54	4.40	243	134	1,099

*kt = kilo tonnes

**koz = kilo ounces

Table 4-2: Underground mineral reserves.

			Ore (kt)	Cu (%)	Au (g/t)	Ag (g/t)	Cu (Mlb)	Au (koz)	Ag (koz)
Phase IV	**Area 2 / 118**	**Probable**	1,731	1.76	0.74	7.19	67	41	400
Phase V/VI	**Minto East**	**Probable**	709	2.28	1.04	6.15	36	24	140
	Copper Keel	**Proven**	106	1.74	0.61	6.3	4	2	22
		Probable	1,455	1.81	0.65	6.7	58	30	313
		Sub-total	1,561	1.81	0.64	6.67	62	32	335
	Wildfire	**Proven**	301	1.8	0.77	6.06	12	7	59
		Probable	59	1.59	1	7.85	2	2	15
		Sub-total	360	1.76	0.8	6.35	14	9	73
	Underground Total	**Proven**	407	1.78	0.73	6.12	16	9	81
		Probable	3,954	1.87	0.76	6.83	163	97	868
		Sub-total	4,361	1.86	0.76	6.77	179	106	948

The current LOM plan, based on the reserves described in Table 4-1 and 4-2, above, forecasts open-pit mining continuing until September 2017, underground until December of 2019, and milling of stockpiles until April of 2022.

5 2012 Environmental Monitoring

The WUL requires that Minto Mine comply with and submit compiled data for the programs and studies outlined within the WUL as a component of the Annual Report. Section 5 of this document presents results from each program and study outlined in the WUL and results interpretation is included when required by the WUL.

5.1 Water Quality Surveillance Program

Water quality sampling and analysis for the reporting period was conducted under Clause 75(a) of the WUL: *"The Licensee shall comply with the Water Quality Surveillance Program that is specified in Appendix 3 to this licence."*

Appendix 1 and 3 of the WUL provide Minto Mine with the necessary guidance for sampling locations, intervals and parameter requirements. Minto Mine updates sampling locations and coordinates annually (Table 5-1). Table 5-2 contains the frequency and type of monitoring that is required under the WUL.

Table 5-1: Water quality surveillance program site descriptions and locations.

Site Name	Description	UTM Location (m) Zone 8	
		Easting	Northing
W1	Lower Reach of Minto Creek	392446	6948251
W2	Minto Creek, upstream of the Minto Creek/Yukon River confluence where the mine access road crosses Minto Creek	392584	6948402
W3	Minto Creek, at the federal Metal Mining Effluent Regulations compliance point	387000	6945778
W4	Yukon River, upstream of the confluence with Minto Creek	394070	6948203
W5	Yukon River, downstream of the confluence with Minto Creek	392583	6949119
W7	Mouth of the tributary on the south side of Minto Creek, approximately 0.8 km downstream of W50	387546	6946034
W8	Western collection sump from the DSTSF	385618	6945054
W8a	Eastern collection sump from DSTSF	385734	6945047
W10	Headwaters of Minto Creek (southwest fork at headwaters)	383855	6943364
W12	Discharge from Main Pit	384544	6945137
W12a	Main Pit	384544	6945137
W13	Mill Water Storage Pond (if not discharging)	385081	6945038
W13a	Discharge from the Mill Water Storage Pond	385295	6945164
W14	Tailings Thickener Overflow	385223	6945089
W15	Upper Minto Creek Storm Water Collection Sump, downstream of the overburden dump, just upstream of Main Pit	384181	6944708
W16	Water Storage Pond	386483	6945537
W16a	Discharge from the Water Storage Pond	386686	6945652
W17	Water Storage Pond Dam Seepage	386686	6945652
W30	Headwaters Minto Creek (northwest fork)	383693	6945026
W32	At toe of Southwest Dump (southwest fork)	383913	6944438
W33	Above Tailings Diversion Ditches	385366	6944033
W35a	Storm Water Collection Point - top of South Diversion Ditch	385381	6944157
W35b	Storm Water Collection Point- bottom of South Diversion Ditch	384980	6944804
W36	Minto Creek Detention Structure	385682	6944510
W37	100 m downstream of Minto Creek Detention Structure (W37 Collection Sump) and upstream of Water Storage Pond	386180	6945294
W38	Original Ground near Southwest Dump 90 m ENE ofW15	384112	6944749
W39	Original Ground near Southwest Dump 165 m ESE ofW15	384067	6944696
W40	Original Ground near Southwest Dump 290 m SE ofW15	384009	6944618
W41	Original Ground (near Southwest Dump 130 m NE ofW15	NE	NE
W42	Storm Water Collection Sump - north side of mine access road 0.5 km	385536	6945206
W43	Storm Water Collection Sump - north side of mine access road at Water Storage Pond - 1.5 km	386371	6945614
W44	Area 2 Underground	384975	6944546
W45	Area 2 Pit	384912	6944068
W46	Minto Creek downstream of W7 and W6 tributaries	387873	6946301
W47	Area 118 Pit Water	NE	NE
W50	Minto Creek, approximately 50 m downstream of the toe of the Water Storage Pond Dam and downstream of the inflow of the treated water	386747	6945682
MC1	Minto Creek upstream of Canyon near Km 8 on mine access road	390967	6947528
WC	Convergence point for W15 and W35 inflows	384947	6944954
WTP	Treated Water from Water Treatment Plant	385126	6945154

* NE: Not established

Table 5-2: Water quality surveillance sampling requirements.

Site Name	Water Quality Sampling	Flow Monitoring	Water Level	Internal Suite	48 and 96-hr LT50	7-day Chronic Toxicity
W1		C				
W2	W	C				Md
W3	W	C		W	Md	
W4	W					
W5	W					
W7	M	M				
W8	W	W		W		
W8a	W	W		W		
W10	M	M				
W12	M	M				
W12A	M	WL, TSL	D,WL, TSL			
W13	M	WL	D, WL			
W13A	M	M				
W14	M	M				
W15	W	W				
W16	Wnf		D, WL	Wnf		
W16a	Wd	Wd		Wd	Md	
W17	W	C				
W30	M	M				
W32	M	M				
W33	M	M				
W35a	M	M				
W35b	M	M				
W36	M	WL	M,WL			
W37	M	M				
W38	M	M				
W39	M	M				
W40	M	M				
W41	M	M				
W42	W	W				
W43	W	W				
W44	W	C				
W45	M	C	D, WL, TWL			
W46	M	M				
W47	M	C				
W50	W	W		W	M	M
MC-1	W	C				
WC	W	W				
WTP	W	W				

W = Weekly, M = Monthly, C = Continuously, WL = Surface Water Level, D = Daily, Wd = Weekly when Discharging, Wnf = Every week from March 15 to freeze up, TSL = Tailings Surface Elevation

The objective of Section 5.1 is to provide a concise summary of Minto Mine water quality monitoring data collected during the 2012 reporting period. Water quality results are presented in monthly reports with original laboratory reports as per WUL Clause 12(a); therefore only a summary of the Water Quality Surveillance Program (WQSP) is presented in this report.

5.1.1 Monitoring Conformance

Table 5-3, below, summarizes the 2012 WQSP monitoring conformance. Where conformance was not achieved, reasons for non-conformance are provided.

Table 5-3: 2012 WQSP monitoring conformance summary.

Site Name	WQ Samples taken in 2012	Reasons for non-conformance
W1	n/a	
W2	52	Site was sampled weekly after channel thawed sufficiently in early April. Sampling continued until late November when stream glaciated and finally froze completely.
W3	71	
W4	30	Sampling did not start until late April as it was unsafe to sample at the Yukon River until it is completely free of ice. The site was sampled for the rest of the year.
W5	27	Sampling did not start until early May as it was unsafe to sample at the Yukon River until it is completely free of ice. Sampling stopped in mid-December when the ice was too thick to auger through.
W7	14	
W8	0	No water was recorded at this site once the Mill Valley Fill Extension was constructed.
W8a	9	Water was not recorded until late September after the construction of the Mill Valley Fill Extension.
W10	7	Visible flows were not noted until late April. Site was visited in late November and mid-December but no flows were noted. No samples collected in January to March and November and December due to frozen conditions.
W12	0	No samples taken.
W12A	13	No sample taken in January.
W13	11	No sample taken in November and December due to unsafe access.
W13A	0	Efforts were made in 2012 to monitor the level in W13 resulting in no recorded overflows.
W14	14	
W15	44	Sampling from this open sump resumed in April when water was present. Sampling ended in late December when the surface of the collection sump froze.
W16	70	
W16a	23	Discharged water from April 11th to May 11th. Approximately 171,000 m^3 of water discharged from Water Storage Pond.
W17	86	
W30	8	The site basin’s surface was completely frozen until early May when monthly sampling started.
W32	10	Sampling for the season did not start until late April.
W33	7	No flow noted at this site until late April. The last sample for the year was collected in October, as no flow was noted in November and December.
W35a	16	Water was reporting to the top of this diversion ditch by early April. Collection continued until mid-October.

Site Name	WQ Samples taken in 2012	Reasons for non-conformance
W35b	6	Sample collection started at the same time as W35a as water reports to this W35b from W35a. Sampling stopped in late June as the ditch was altered and W35B was destroyed.
W36	14	Sampling started in May and ended in November due to frozen conditions.
W37	6	No flow was recorded for the majority of the summer.
W38	6	No flow observed until July. Sampling continued until the end of the year.
W39	2	Site was dry most of the year.
W40	1	Only sample collected was in April. Site visited but dry for the rest of the year.
W41	0	Site was never established.
W42	24	“Storm Water Collection” – water should only report here during freshet period or excessive rain events.
W43	9	“Storm Water Collection” – water should only report here during freshet period or excessive rain events.
W44	0	Site not established in 2012. Underground did not have water collection sump established until early 2013. New site as per Amendment 8 of the WUL.
W45	4	Site established in August. New site as per Amendment 8 of the WUL.
W46	4	Site established in August. New site as per Amendment 8 of the WUL.
W47	0	New site as per Amendment 8 of the WUL. Site not established yet.
W50	27	Flows were only recorded during discharge event.
MC-1	37	Site safety concerns present in winter months. Site only accessible from early April to late October.
WC	0	No sample collected. Water from sources known.
WTP	25	Water treated discharged to Water Storage Pond. No WTP water discharge to environment

Water quality samples taken in 2012 were compared to historical sampling values when possible. For results that were below the detectable limit, a note of “BDL” has been used in the summary tables. In 2012, values below detection limit (BDL) were taken at the detection limit when used for calculations of the mean, minimum and maximum results. In previous years the mean, minimum and maximum results were calculated using half of the detection limit as the value. A “*” has been used in the tables in this section to denote when results were not available.

5.1.2 W2 – Minto Creek at Lower Road Crossing Water Quality

Table 5-4 summarizes water quality results from station W2 from 2006 to 2012; 52 samples were collected from W2 during the reporting period. The 2006 -2012 W2 results for parameters copper, aluminum, cadmium and selenium are further displayed in Figures 5-1 and 5-2.

Table 5-4: 2006-2012 W2 water quality results summary table.

W2	Detection	2006 Summary Statistics			2007 Summary Statistics			2008 Summary Statistics			2009 Summary Statistics		
Physical Parameters	Limit	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
pH		8.17	7.75	8.39	7.83	7.19	8.34	8.08	7.94	8.3	7.97	7.07	8.15
Total Suspended Solids (mg/L)	1	30.2	3.5	120	80	2	257	6	4	10	24	1	100
Nutrients (mg/L)													
Ammonial Nitrogen	0.005	0.021	0.006	0.06	0.015	0.003	0.053	0.025	0.025	0.025	0.04	0.02	0.12
Nitrate Nitrogen	0.02	*	*	*	*	*	*	*	*	*	*	*	*
Nitrite Nitrogen	0.005	*	*	*	*	*	*	*	*	*	*	*	*
Total Metals (mg/L)													
Aluminum T-Al	0.005	0.5828	0.0111	7.28	0.869	0.007	5.13	0.112	0.041	0.253	0.604	0.01	2.62
Arsenic T-As	0.0001	0.00097	0.00043	0.00632	0.00085	0.0003	0.00296	0.00051	0.0002	0.0012	0.0007	0.0001	0.0018
Cadmium T-Cd	0.00001	0.000121	0.000057	0.000167	0.000080	0.00005	0.000135	0.000024	0.0001	0.00005	0.00003	0.000005	0.00007
Chromium T-Cr	0.001	0.00323	0.00054	0.0127	0.0028	0.0007	0.0104	0.0007	0.000005	0.0014	0.002	0.0002	0.0052
Copper T-Cu	0.0002	0.00427	0.00122	0.021	0.0077	0.002	0.0323	0.0025	0.00025	0.003	0.017	0.002	0.052
Iron T-Fe	0.005	0.854	0.052	10.4	2.17	0.1	8.09	0.28	0.002	0.46	1.23	0.05	4.08
Lead T-Pb	0.0002	0.00076	0.00006	0.00394	0.00070	0.0001	0.00264	0.00006	0.1	0.0001	0.0005	0.00005	0.0018
Molybdenum T-Mo	0.001	*	*	*	*	*	*	*	*	*	*	*	*
Nickel T-Ni	0.001	0.00198	0.00051	0.0119	0.00307	0.0011	0.0115	0.0019	0.006	0.004	0.00310	0.0005	0.01
Selenium T-Se	0.0001	*	*	*	*	*	*	*	*	*	*	*	*
Zinc T-Zn	0.005	0.0059	0.001	0.0324	0.007	0.001	0.025	0.005	0.0007	0.007	0.012	0.002	0.07

W2	Detection	2010 Summary Statistics			2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters	Limit	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Min	Max
pH		8.13	**	8.46	8.04	7.32	8.39	7.9	6.3	8.7	6.3	8.7
Total Suspended Solids (mg/L)	1	10.43	1	310	79	1	710	345	2	2600	1.0	2600
Nutrients (mg/L)												
Ammonial Nitrogen	0.005	0.052	0.005	0.5	0.0283	0.0050	0.2690	0.0640	0.0051	0.2300	0.003	0.5000
Nitrate Nitrogen	0.02	*	*	*	0.201	0.020	0.807	0.194	0.007	0.559	0.007	0.807
Nitrite Nitrogen	0.005	*	*	*	0.007	0.005	0.021	0.017	0.002	0.047	0.002	0.0467
Total Metals (mg/L)												
Aluminum T-Al	0.005	0.2	0.01	4.93	2.038	0.027	18.500	5.499	0.011	30.700	0.007	30.700
Arsenic T-As	0.0001	0.00053	0.0002	0.0034	0.0015	0.0004	0.0094	0.0033	0.0003	0.0151	0.0001	0.0151
Cadmium T-Cd	0.00001	0.000078	0.00001	0.00016	0.00007	0.00001	0.00048	0.00016	0.00001	0.00072	0.00001	0.00072
Chromium T-Cr	0.001	0.0018	0.001	0.01	0.006	0.001	0.038	0.014	0.001	0.058	0.00001	0.058
Copper T-Cu	0.0002	0.0048	0.0017	0.0763	0.0130	0.0017	0.1250	0.0160	0.0014	0.0782	0.00025	0.1250
Iron T-Fe	0.005	0.4	0.021	9.57	3.655	0.135	31.700	9.298	0.042	51.500	0.002	51.50
Lead T-Pb	0.0002	0.00046	0.0002	0.029	0.0012	0.0002	0.0090	0.0035	0.0002	0.0155	0.0001	0.0290
Molybdenum T-Mo	0.001	*	*	*	0.001	0.0010	0.002	0.001	0.001	0.003	0.001	0.0027
Nickel T-Ni	0.001	0.0019	0.001	0.011	0.005	0.0010	0.041	0.012	0.001	0.063	0.001	0.0629
Selenium T-Se	0.0001	*	*	*	0.0002	0.0001	0.0006	0.0003	0.0001	0.0009	0.0001	0.0009
Zinc T-Zn	0.005	0.0091	0.005	0.026	0.011	0.0050	0.068	0.035	0.005	0.136	0.001	0.136

* not available
** value eliminated for suspected sampling error

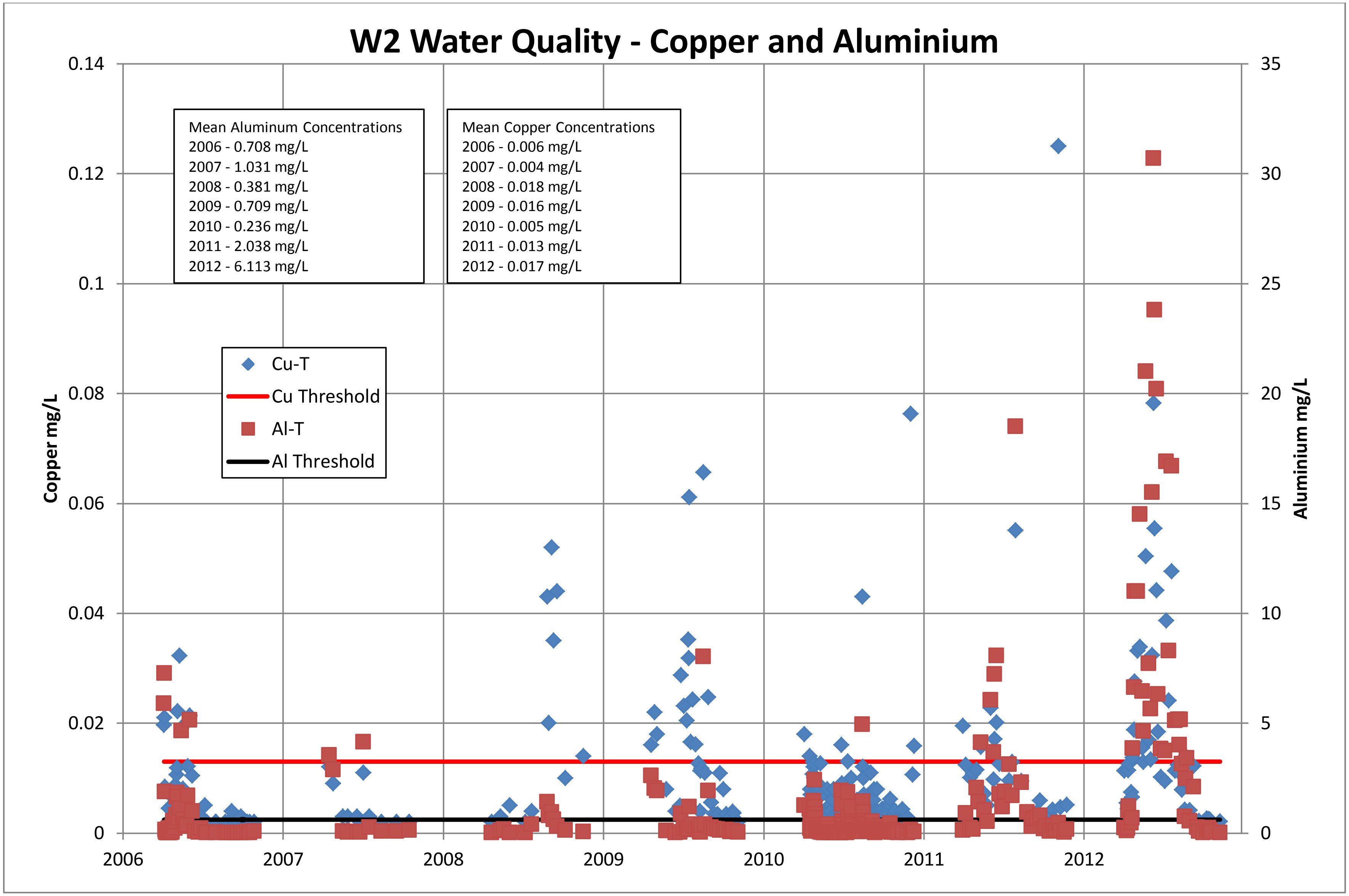

Figure 5-1: 2006 - 2012 W2 water quality for copper and aluminum with corresponding 2012 WUL thresholds.

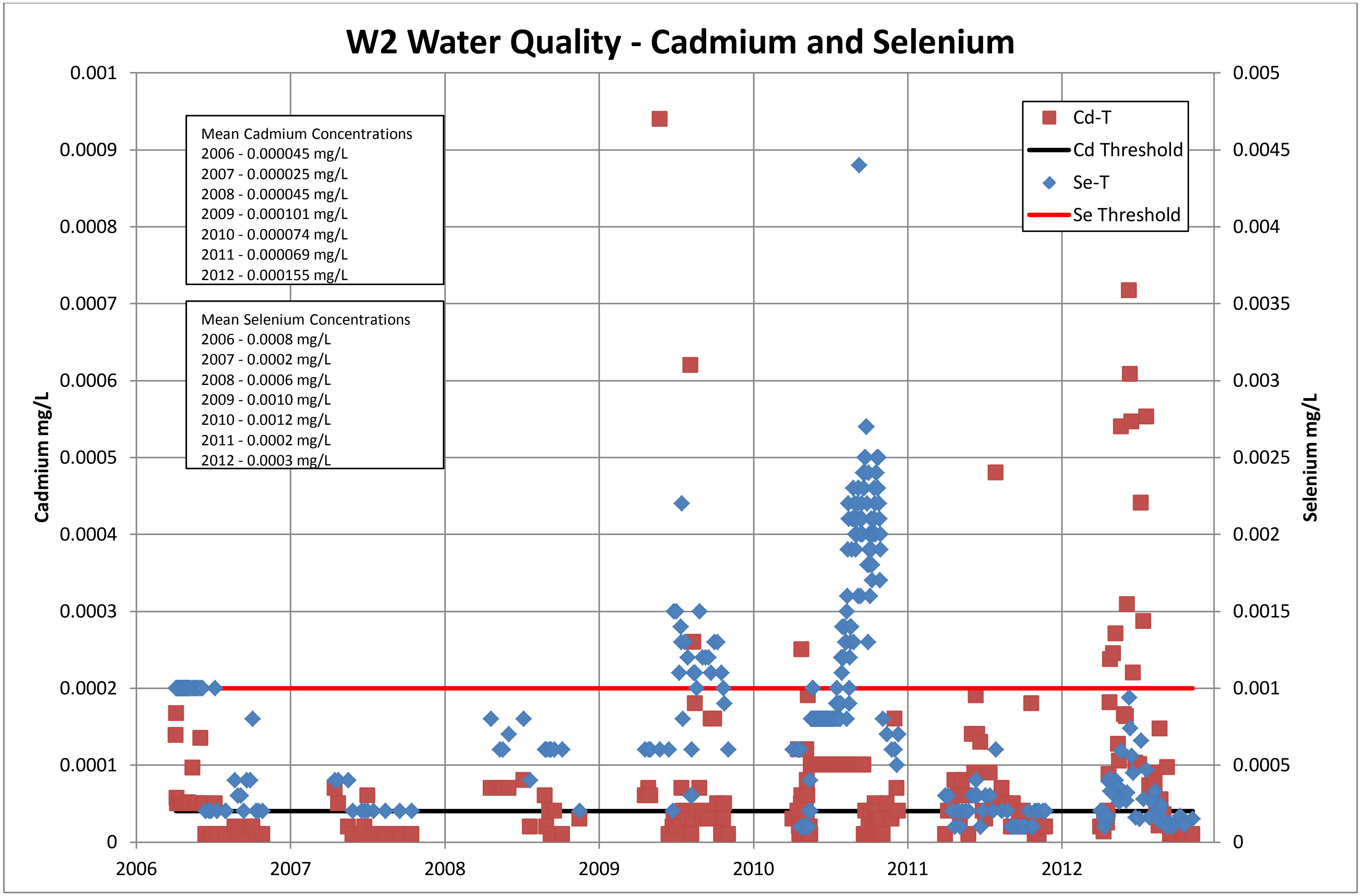

Figure 5-2: 2006- 2012 W2 water quality for cadmium and selenium with corresponding 2012 WUL thresholds.

5.1.3 W3 – Minto Creek, at the Federal Metal Mining Effluent Regulations (MMER) Compliance Point

Table 5-5 summarizes water quality results from station W3 from 2006 to 2012; 71 samples were collected from W3 during the 2012 reporting period. The 2006-2012 W3 results for parameters copper, aluminum, cadmium and selenium are further displayed in Figures 5-3 and 5-4.

Table 5-5: 2006 – 2012 W3 water quality results summary table.

W3	Detection Limit	2006 Summary Statistics			2007 Summary Statistics			2008 Summary Statistics			2009 Summary Statistics		
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
pH		8.16	7.31	8.45	7.75	7.05	8.36	7.95	7.75	8.19	7.90	7.44	8.20
Total Suspended Solids (mg/L)	1	8	3	26	15	2	83	5	1	34	8	1	70
Nutrients (mg/L)													
Ammonial Nitrogen	0.005	0.0247	0.0073	0.0700	0.0201	0.0020	0.1000	0.0272	0.0250	0.0700	0.0590	0.0060	0.3800
Nitrate Nitrogen	0.02	*	*	*	*	*	*	*	*	*	*	*	*
Nitrite Nitrogen	0.005	*	*	*	*	*	*	*	*	*	*	*	*
Total Metals (mg/L)													
Aluminum T-Al	0.005	0.241	0.006	0.848	0.348	0.006	2.130	0.217	0.010	1.140	0.214	0.002	2.140
Arsenic T-As	0.0001	0.0005	0.0002	0.0010	0.0007	0.0002	0.0090	0.0005	0.0001	0.0010	0.0005	0.0001	0.0024
Cadmium T-Cd	0.00001	BDL	BDL	BDL	0.00003	0.00001	0.00013	0.00002	0.00001	0.00020	0.00003	0.00001	0.00014
Chromium T-Cr	0.001	0.001	0.001	0.002	0.001	0.001	0.007	0.001	0.000	0.002	0.001	0.000	0.004
Copper T-Cu	0.0002	0.0122	0.0017	0.0332	0.0116	0.0010	0.1010	0.0086	0.0020	0.0200	0.0210	0.0030	0.1660
Iron T-Fe	0.005	0.344	0.030	1.320	0.588	0.100	3.200	0.293	0.040	1.400	0.480	0.060	4.530
Lead T-Pb	0.0002	0.0001	0.0001	0.0004	0.0004	0.0001	0.0031	0.0001	0.0001	0.0007	0.0002	0.0001	0.0010
Molybdenum T-Mo	0.001	*	*	*	*	*	*	*	*	*	*	*	*
Nickel T-Ni	0.001	0.001	0.001	0.003	0.002	0.001	0.030	0.001	0.000	0.005	0.002	0.000	0.012
Selenium T-Se	0.0001	*	*	*	*	*	*	*	*	*	*	*	*
Zinc T-Zn	0.005	0.004	0.002	0.024	0.006	0.001	0.050	0.007	0.001	0.020	0.009	0.001	0.055

W3	Detection Limit	2010 Summary Statistics			2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Min	Max
pH		8.15	7.81	8.60	8.04	7.09	8.38	7.6	6.0	8.9	6.02	8.89
Total Suspended Solids (mg/L)	1	2	1	21	23	BDL	460	64	2	985	1.0	985.00
Nutrients (mg/L)												
Ammonial Nitrogen	0.005	0.1010	0.0050	0.5000	0.0321	BDL	0.3800	0.0242	0.0057	0.1600	0.002	0.50
Nitrate Nitrogen	0.02	*	*	*	7.33	0.36	289.00	1.224	0.338	4.230	0.34	289.00
Nitrite Nitrogen	0.005	*	*	*	0.014	BDL	0.268	0.005	0.001	0.015	0.001	0.27
Total Metals (mg/L)												
Aluminum T-Al	0.005	0.133	0.012	5.280	0.235	0.005	10.800	0.491	0.004	16.600	0.0020	16.60
Arsenic T-As	0.0001	0.0004	0.0001	0.0012	0.0004	0.0001	0.0044	0.0005	0.0002	0.0062	0.0001	0.01
Cadmium T-Cd	0.00001	0.00008	0.00001	0.00021	0.00004	0.00001	0.00030	0.00005	0.00001	0.00043	0.00001	0.0004
Chromium T-Cr	0.001	0.002	0.001	0.016	0.001	0.001	0.017	0.009	0.000	0.025	0.0001	0.02
Copper T-Cu	0.0002	0.0059	0.0020	0.0730	0.0114	0.0016	0.1280	0.0123	0.0016	0.2120	0.0010	0.21
Iron T-Fe	0.005	0.068	0.011	0.799	0.343	0.010	13.500	0.751	0.017	26.800	0.0100	26.80
Lead T-Pb	0.0002	0.0008	0.0002	0.0935	0.0003	0.0002	0.0029	0.0017	0.00002	0.0075	0.0000	0.09
Molybdenum T-Mo	0.001	*	*	*	0.005	0.002	0.042	0.005	0.004	0.010	0.0020	0.04
Nickel T-Ni	0.001	0.002	0.001	0.139	0.002	0.001	0.027	0.002	0.001	0.030	0.0002	0.14
Selenium T-Se	0.0001	*	*	*	0.0008	0.0003	0.0066	0.0006	0.0003	0.0016	0.0003	0.01
Zinc T-Zn	0.005	0.011	0.005	0.168	0.010	0.005	0.100	0.025	0.000	0.086	0.0004	0.17

*not available

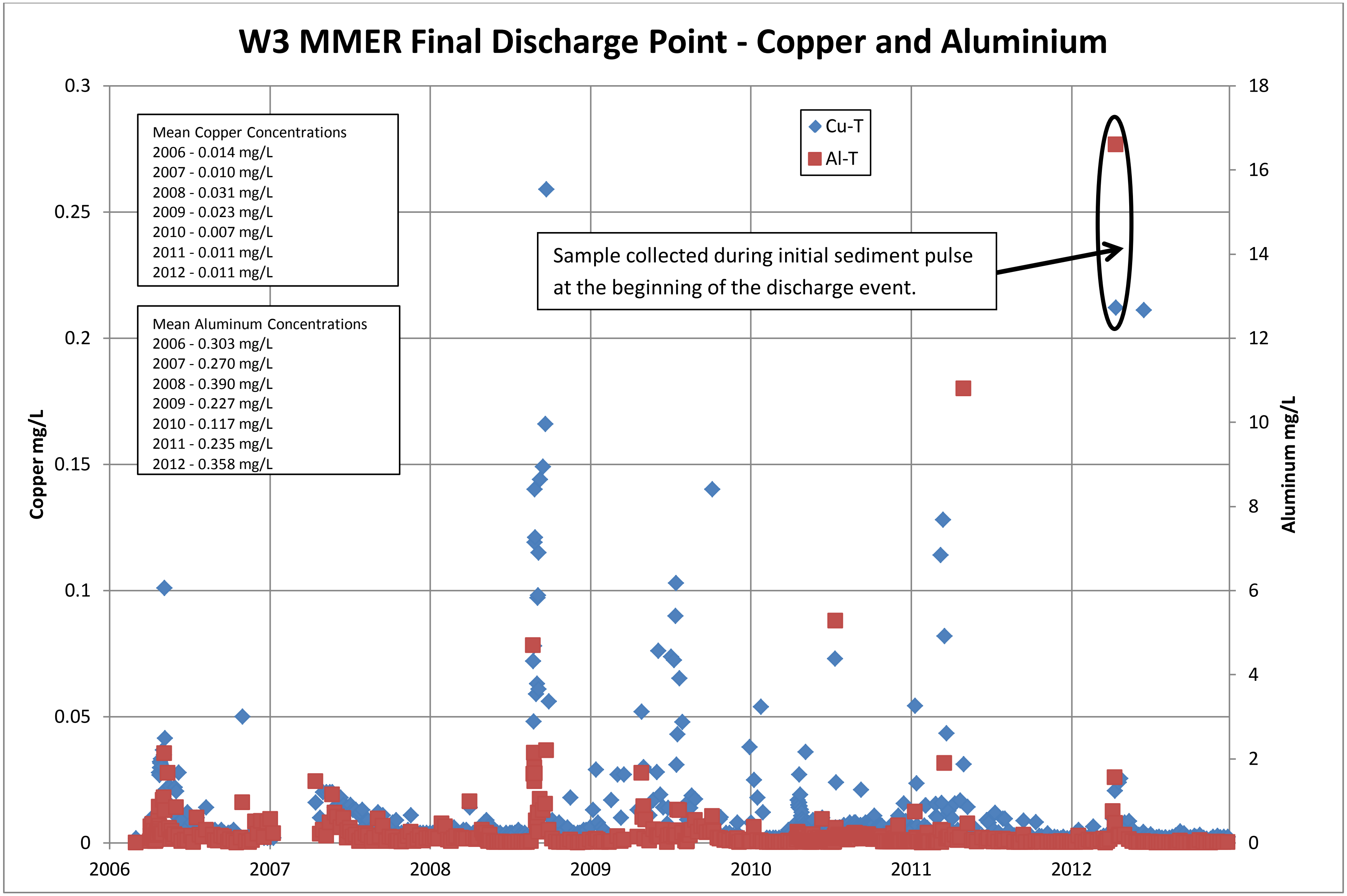

Figure 5-3: 2006 – 2012 W3 water quality for copper and aluminum.

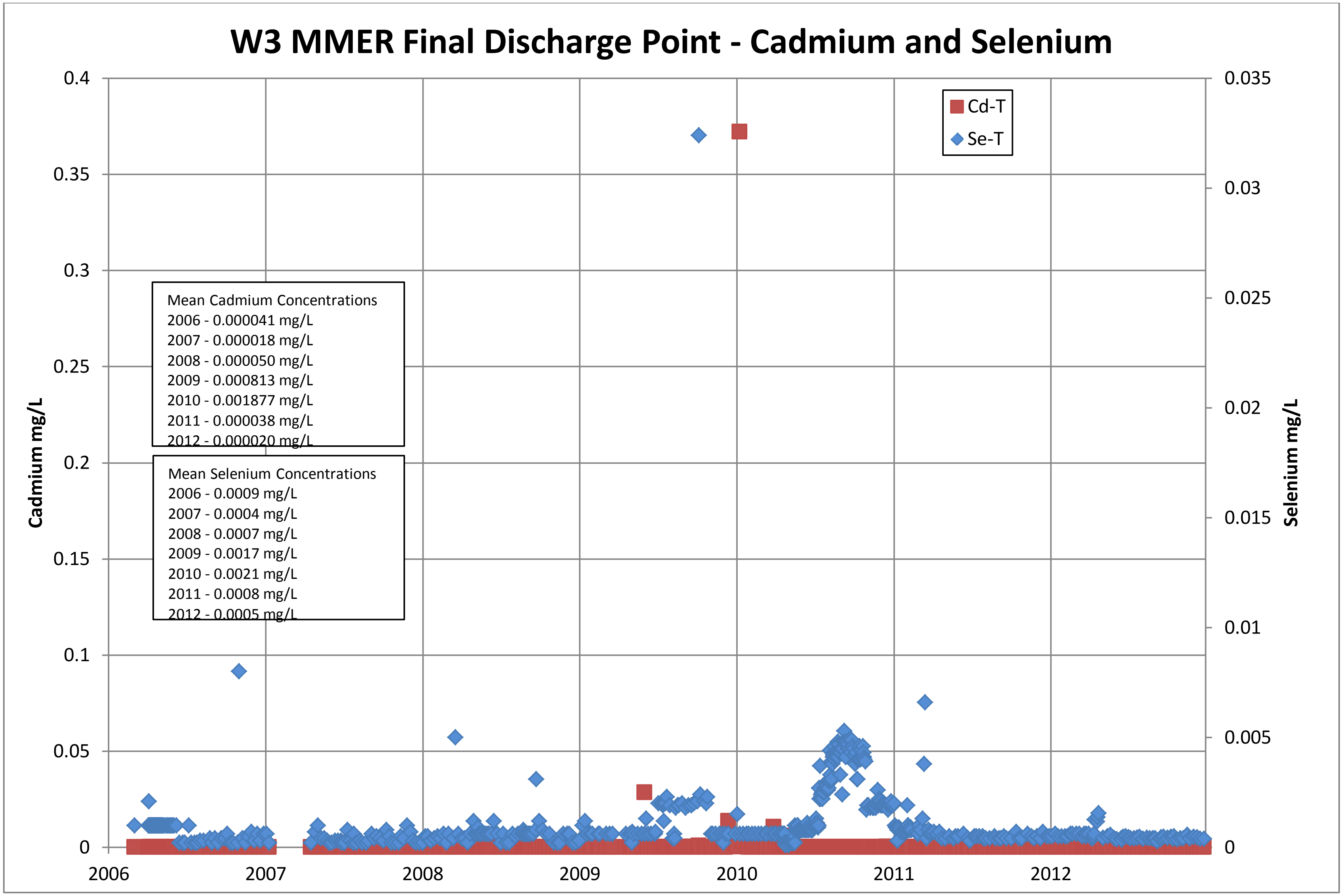

Figure 5-4: 2006 – 2012 W3 water quality for cadmium and selenium.

5.1.4 W7 – North Flowing Tributary to Minto Creek

Table 5-6 summarizes water quality results from station W7 for 2011 and 2012; 14 samples were taken in 2012.

Table 5-6: 2011 - 2012 W7 water quality results summary table.

W7	Detection	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters	Limit	Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.83	7.11	8.12	7.64	6.72	8.44	6.72	8.44
Total Suspended Solids (mg/L)	1	67	BDL	400	22	2	165	BDL	400
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	0.015	0.006	0.025	0.0403	0.0050	0.1800	0.0050	0.1800
Nitrate Nitrogen	0.02	0.065	BDL	0.136	0.161	0.063	0.324	BDL	0.32
Nitrite Nitrogen	0.005	0.005	BDL	0.007	0.012	0.010	0.015	BDL	0.015
Total Metals (mg/L)									
Aluminum T-Al	0.005	1.574	0.065	9.230	0.536	0.010	5.380	0.010	9.230
Arsenic T-As	0.0001	0.0011	0.0003	0.0037	0.0008	0.0003	0.0023	0.0003	0.0037
Cadmium T-Cd	0.00001	0.00009	0.00001	0.00025	0.00003	0.00001	0.00012	0.00001	0.00025
Chromium T-Cr	0.001	0.006	0.001	0.021	0.005	0.002	0.011	0.00100	0.021
Copper T-Cu	0.0002	0.0104	0.0012	0.0285	0.0037	0.0011	0.0102	0.0011	0.0285
Iron T-Fe	0.005	2.733	0.187	13.800	1.263	0.043	7.880	0.043	13.800
Lead T-Pb	0.0002	0.0008	BDL	0.0035	0.0008	0.0003	0.0018	BDL	0.0035
Molybdenum T-Mo	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002
Nickel T-Ni	0.001	0.005	0.001	0.019	0.003	0.001	0.011	0.001	0.019
Selenium T-Se	0.0001	0.0002	BDL	0.0003	0.0002	0.0001	0.0004	BDL	0.0004
Zinc T-Zn	0.005	0.017	0.009	0.029	0.008	0.006	0.015	0.006	0.029

5.1.5 W10 – Minto Creek Headwaters (South-West Fork)

Table 5-7 summarizes water quality results from station W10 for 2011 and 2012; 7 water quality samples were taken in 2012.

Table 5-7: 2011 – 2012 W10 water quality results summary table.

W10	Detection	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters	Limit	Mean	Min	Max	Mean	Min	Max	Min	Max
pH		6.81	6.22	8.05	7.55	6.95	8.02	6.22	8.05
Total Suspended Solids (mg/L)	1	12	4	22	12	2.4	43.3	2	43
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	0.012	0.006	0.019	0.034	0.006	0.087	0.0057	0.0870
Nitrate Nitrogen	0.02	0.02	BDL	0.02	0.11	0.106	0.106	BDL	0.11
Nitrite Nitrogen	0.005	0.005	BDL	0.005	0.005	0.005	0.005	BDL	0.005
Total Metals (mg/L)									
Aluminum T-Al	0.005	1.235	0.331	4.530	0.275	0.032	0.930	0.032	4.530
Arsenic T-As	0.0001	0.0006	0.0003	0.0017	0.0003	0.0001	0.0006	0.0001	0.0017
Cadmium T-Cd	0.00001	0.00006	BDL	0.00015	0.00004	0.000012	0.00009	BDL	0.00015
Chromium T-Cr	0.001	0.001	BDL	0.003	0.001	0.001	0.001	BDL	0.003
Copper T-Cu	0.0002	0.2682	0.0277	1.0200	0.0593	0.0039	0.2260	0.0039	1.0200
Iron T-Fe	0.005	3.521	0.244	14.900	0.812	0.248	1.970	0.244	14.900
Lead T-Pb	0.0002	0.00	BDL	0.0009	0.0003	0.0003	0.00034	BDL	0.0009
Molybdenum T-Mo	0.001	BDL	BDL	BDL	0.001	0.001	0.00	BDL	0.001
Nickel T-Ni	0.001	0.002	BDL	0.005	0.002	0.001	0.0023	BDL	0.005
Selenium T-Se	0.0001	0.0002	BDL	0.0006	0.0002	0.00011	0.00023	BDL	0.0006
Zinc T-Zn	0.005	0.01	BDL	0.05	0.03	0.0078	0.05	BDL	0.050

5.1.6 W12A – Water in the Main Pit

Table 5-8 summarizes water quality results from station W12A from 2009 to 2012; 13 water quality samples were taken in 2012. W12A was previously sampled under the identity of W12; however, in Amendment 8 of the WUL the station known as W12 was referred to as W12A. Moving forward, Minto will refer to the sampling site known as W12 as W12A. The 2007-2012 W12A results for parameters copper, aluminum, cadmium and selenium are further displayed in Figures 5-5 and 5-6.

Table 5-8: 2009 – 2012 W12A water quality results summary table.

W12A	Detection	2009 Summary Statistics			2010 Summary Statistics			2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters	Limit	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.46	6.97	7.96	7.95	7.87	8.05	7.96	7.59	8.15	7.9	7.1	8.5	7.08	8.52
Total Suspended Solids (mg/L)	1	54	1	251	40	18	66	12	1	35	12	2	32	1	35
Nutrients (mg/L)															
Ammonial Nitrogen	0.005	1.040	1.000	1.090	5.600	1.600	24.000	0.726	0.005	4.400	0.1157	0.0154	0.3210	0.0050	4.4000
Nitrate Nitrogen	0.02	*	*	*	*	*	*	13.9	1.85	27	17.445	8.880	33.100	1.85	33.10
Nitrite Nitrogen	0.005	*	*	*	*	*	*	0.120	0.007	0.600	0.084	0.018	0.255	0.007	0.600
Total Metals (mg/L)															
Aluminum T-Al	0.005	1.697	0.020	5.080	1.362	0.730	2.310	0.529	0.018	2.020	0.303	0.024	0.843	0.018	2.020
Arsenic T-As	0.0001	0.0013	0.0006	0.0025	0.0012	0.0005	0.0017	0.0012	0.0005	0.0018	0.0007	0.0005	0.0010	0.0005	0.0018
Cadmium T-Cd	0.00001	0.00037	0.00003	0.00135	0.00014	0.00005	0.00039	0.00008	0.00004	0.00026	0.00004	0.00002	0.00009	0.00002	0.00026
Chromium T-Cr	0.001	0.002	0.0002	0.008	0.0020	0.000	0.003	0.001	0.001	0.002	0.002	0.002	0.002	0.001	0.002
Copper T-Cu	0.0002	0.939	0.010	6.210	0.364	0.168	1.180	0.1077	0.0596	0.2120	0.0823	0.0622	0.1050	0.0596	0.2120
Iron T-Fe	0.005	3.020	0.052	8.790	2.000	0.740	3.220	0.830	0.024	3.440	0.372	0.041	1.240	0.024	3.440
Lead T-Pb	0.0002	0.0017	0.0000	0.0040	0.0010	0.0005	0.0017	0.0004	0.0002	0.0011	0.0003	0.0002	0.0004	0.0002	0.0011
Molybdenum T-Mo	0.001	*	*	*	*	*	*	0.018	0.003	0.044	0.020	0.014	0.027	0.003	0.044
Nickel T-Ni	0.001	0.003	0.001	0.008	0.002	0.000	0.004	0.002	0.001	0.003	0.002	0.001	0.004	0.001	0.004
Selenium T-Se	0.0001	*	*	*	*	*	*	0.0049	0.0011	0.0099	0.0056	0.0039	0.0069	0.0011	0.0099
Zinc T-Zn	0.005	0.023	0.004	0.075	0.011	0.005	0.016	0.010	0.005	0.047	0.007	0.005	0.012	0.005	0.047

*not available

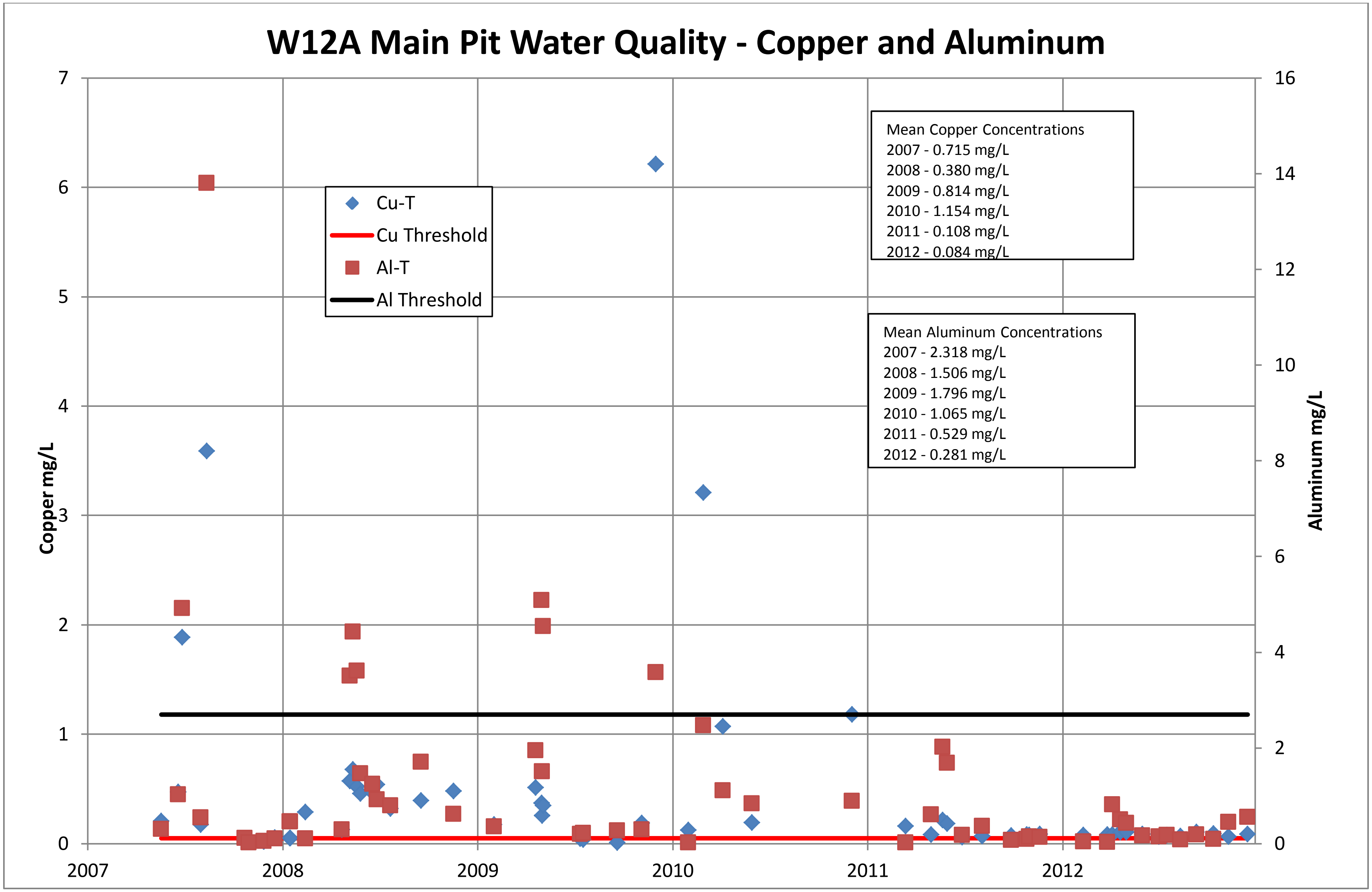

Figure 5-5: 2007 – 2012 W12A water quality for copper and aluminum with corresponding 2012 WUL thresholds.

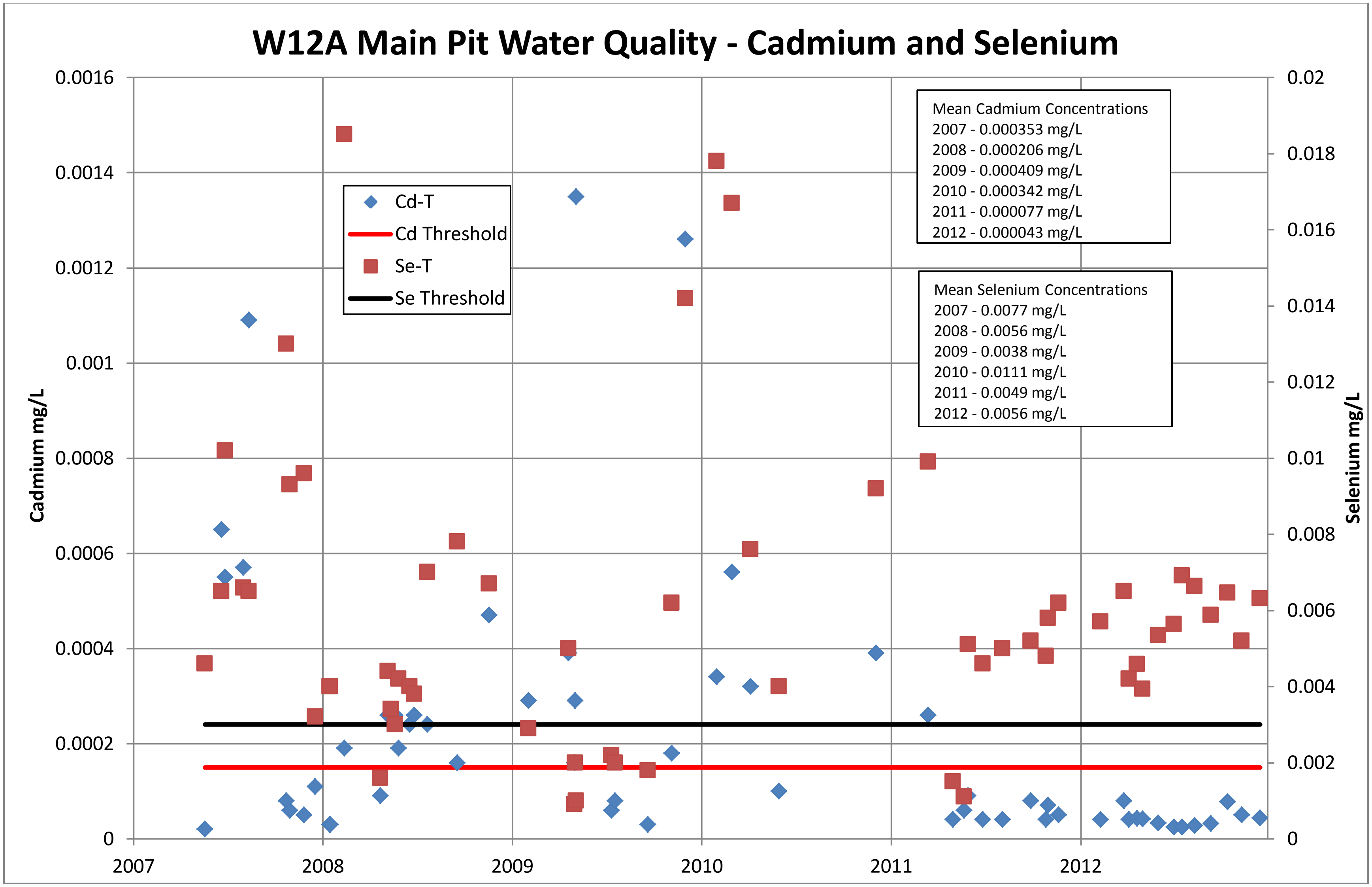

Figure 5-6: 2007 – 2012 W12A water quality for cadmium and selenium with corresponding 2012 WUL thresholds.

5.1.7 W13 – Mill Water Pond

Table 5-9 summarizes water quality results from station W13 for 2011 and 2012; 11 water quality samples were taken in 2012.

Table 5-9: 2011 – 2012 W13 water quality results summary table.

W13	Detection Limit	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.84	7.66	8.01	8.01	7.5	8.5	7.50	8.50
Total Suspended Solids (mg/L)	1	15	6	29	71	18	151	6	151
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	3.20	1.08	6.50	1.23	0.83	1.61	0.8300	6.5000
Nitrate Nitrogen	0.02	52	39	73	39	31	44	31.00	73.00
Nitrite Nitrogen	0.005	1.02	0.51	1.53	1.283	0.65	2.32	0.510	2.320
Total Metals (mg/L)									
Aluminum T-Al	0.005	0.656	0.046	1.220	2.013	0.575	4.100	0.046	4.100
Arsenic T-As	0.0001	0.0006	0.0005	0.0008	0.0006	0.0003	0.0011	0.0003	0.0011
Cadmium T-Cd	0.00001	0.00011	0.00006	0.00018	0.00017	0.00006	0.00043	0.0001	0.00043
Chromium T-Cr	0.001	0.0005	BDL	0.0006	0.0026	0.0012	0.0040	BDL	0.004
Copper T-Cu	0.0002	0.1014	0.0215	0.2030	0.4537	0.0677	1.4100	0.0215	1.4100
Iron T-Fe	0.005	0.652	0.007	1.270	2.407	0.432	8.240	0.007	8.240
Lead T-Pb	0.0002	0.0004	BDL	0.0006	0.0011	0.0003	0.0032	BDL	0.0032
Molybdenum T-Mo	0.001	0.085	0.055	0.115	0.1032	0.078	0.141	0.055	0.141
Nickel T-Ni	0.001	0.0014	BDL	0.003	0.0017833	0.001	0.004	BDL	0.004
Selenium T-Se	0.0001	0.0751	0.0189	0.1920	0.0587	0.0255	0.0946	0.0189	0.1920
Zinc T-Zn	0.005	0.007	BDL	0.016	0.018	0.0053	0.046	BDL	0.046

5.1.8 W13A – Discharge from Mill Water Storage Pond

In 2012, Minto Mine made a substantial effort to limit/eliminate the overflow of the Mill Pond. Minto Mine did not record any Mill Pond overflow events in 2012 and therefore, no samples were collected for water quality site W13A.

5.1.9 W 14 – Tailings Thickener Overflow

Table 5-10 summarizes water quality results from station W14from 2009 to 2012; 14 water quality samples were taken in 2012.

Table 5-10: 2009 – 2012 W14 water quality results summary table.

W14	Detection	2009 Summary Statistics			2010 Summary Statistics			2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters	Limit	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Min	Max
pH		8.25	7.8	8.67	8.20	8.03	8.33	7.79	7.57	8.07	8.44	8.09	8.60	7.57	8.60
Total Suspended Solids (mg/L)	1	311	24	1120	60	25	140	52	17	170	119	36	262	17	262
Nutrients (mg/L)															
Ammonial Nitrogen	0.005	*	*	*	1.990	0.650	4.400	3.72	1.54	8.00	1.17	0.82	1.50	0.8200	8.0000
Nitrate Nitrogen	0.02	*	*	*	*	*	*	62	33	86	35.4	19.9	44.2	19.90	86.00
Nitrite Nitrogen	0.005	*	*	*	*	*	*	1.14	0.49	2.04	0.80	0.47	1.00	0.465	2.040
Total Metals (mg/L)															
Aluminum T-Al	0.005	7.115	0.928	20.500	1.840	0.612	3.000	1.132	0.431	2.710	2.120	2.010	2.230	0.431	2.710
Arsenic T-As	0.0001	0.0018	0.0005	0.0040	0.0006	0.0004	0.0007	0.0006	0.0003	0.0008	0.0006	0.0006	0.0006	0.0003	0.0008
Cadmium T-Cd	0.00001	0.00203	0.00006	0.01590	0.00014	0.00003	0.00040	0.00013	0.00004	0.00044	0.00008	0.00006	0.00009	0.00004	0.00044
Chromium T-Cr	0.001	0.007	0.0008	0.022	0.001	0.0000	0.002	0.001	0.001	0.003	0.002	0.002	0.002	0.001	0.003
Copper T-Cu	0.0002	16.726	0.114	176.000	0.423	0.035	1.700	0.392	0.012	3.670	0.122	0.104	0.139	0.0118	3.6700
Iron T-Fe	0.005	18.930	0.300	105.000	2.202	0.685	3.490	1.623	0.016	5.450	2.535	1.790	3.280	0.016	5.450
Lead T-Pb	0.0002	0.0054	0.0004	0.0380	0.0010	0.0002	0.0023	0.0004	0.0002	0.0013	0.0007	0.0006	0.0009	0.0002	0.0013
Molybdenum T-Mo	0.001	*	*	*	*	*	*	0.099	0.072	0.147	0.115	0.115	0.115	0.072	0.147
Nickel T-Ni	0.001	0.004	0.001	0.010	0.001	0.000	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.001	0.002
Selenium T-Se	0.0001	*	*	*	*	*	*	0.0859	0.0077	0.2590	0.0330	0.0278	0.0382	0.0077	0.2590
Zinc T-Zn	0.005	0.078	0.009	0.290	0.013	0.005	0.023	0.009	0.005	0.027	0.013	0.010	0.017	0.005	0.027

* not available

5.1.10 W15 – Upper Minto Creek Stormwater Collection Point

Table 5-11 summarizes water quality results from station W15from 2009 to 2012; 44 water quality samples were taken in 2012. The 2009-2012 W15 results for parameters copper, aluminum, cadmium and selenium are further displayed in Figures 5-7 and 5-8.

Table 5-11: 2009 – 2012 W15 water quality results summary table.

W15	Detection Limit	2009 Summary Statistics			2010 Summary Statistics			2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.38	6.16	8.18	7.59	6.76	8.29	7.89	7.32	8.34	7.6	6.9	10.0	6.88	9.95
Total Suspended Solids (mg/L)	1	44	2	370	16	2	67	15	1	68	9	2	31	1	68
Nutrients (mg/L)															
Ammonial Nitrogen	0.005	0.050	0.016	0.082	0.126	0.002	0.450	0.09	0.005	0.70	0.0942	0.0058	0.5000	0.0050	0.7010
Nitrate Nitrogen	0.02	*	*	*	*	*	*	11.03	2.69	56.1	8.037	1.900	42.500	1.90	56.10
Nitrite Nitrogen	0.005	*	*	*	*	*	*	0.09	0.005	0.38	0.052	0.006	0.269	0.005	0.383
Total Metals (mg/L)															
Aluminum T-Al	0.005	1.321	0.046	9.420	0.438	0.030	1.370	0.400	0.006	2.660	0.242	0.028	0.969	0.006	2.660
Arsenic T-As	0.0001	0.0012	0.0004	0.0025	0.0009	0.0002	0.0023	0.0005	0.0002	0.0016	0.0006	0.0004	0.0009	0.0002	0.0016
Cadmium T-Cd	0.00001	0.00008	0.00000	0.00025	0.00007	0.00000	0.00038	0.00005	0.00001	0.00023	0.00004	0.00001	0.00013	0.00001	0.00023
Chromium T-Cr	0.001	0.002	0.0004	0.006	0.001	0.0000	0.002	0.001	0.001	0.002	0.003	0.000	0.012	0.0003	0.012
Copper T-Cu	0.0002	0.081	0.011	0.469	0.039	0.015	0.100	0.059	0.007	0.416	0.0271	0.0064	0.1070	0.0064	0.4160
Iron T-Fe	0.005	2.591	0.280	10.700	1.432	0.250	6.060	0.873	0.194	4.300	0.989	0.180	2.820	0.180	4.300
Lead T-Pb	0.0002	0.0008	0.0000	0.0045	0.0004	0.0001	0.0018	0.0003	0.0002	0.0015	0.0003	0.0001	0.0004	0.0001	0.0015
Molybdenum T-Mo	0.001	*	*	*	*	*	*	0.003	0.001	0.008	0.002	0.001	0.005	0.001	0.008
Nickel T-Ni	0.001	0.003	0.001	0.009	0.002	0.000	0.007	0.001	0.001	0.005	0.002	0.001	0.006	0.001	0.006
Selenium T-Se	0.0001	*	*	*	*	*	*	0.0021	0.0004	0.0113	0.0016	0.0004	0.0066	0.0004	0.0113
Zinc T-Zn	0.005	0.015	0.005	0.050	0.006	0.002	0.018	0.007	0.005	0.018	0.010	0.004	0.024	0.004	0.024

* not available

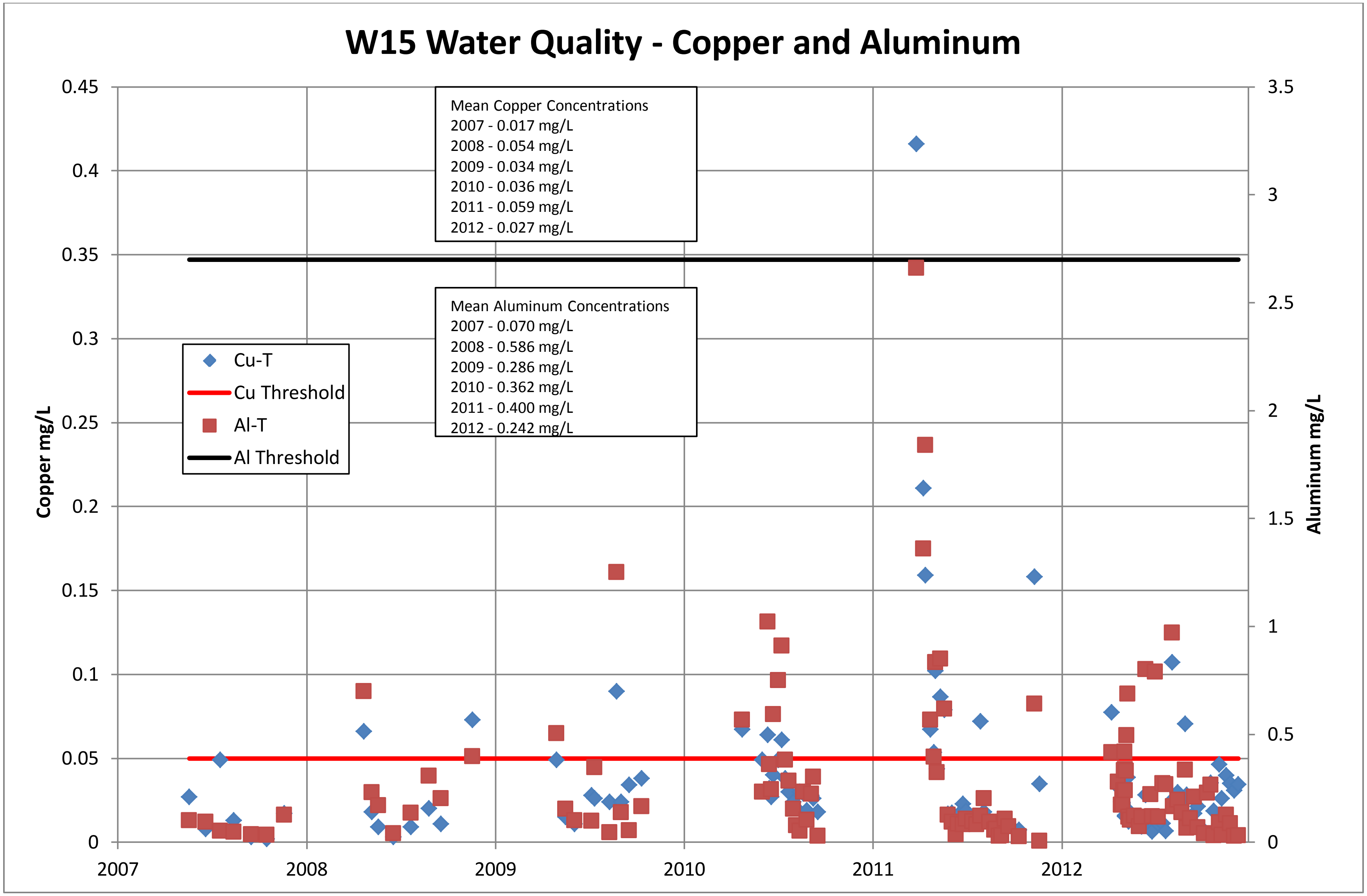

Figure 5-7: 2007 – 2012 W15 water quality for copper and aluminum with corresponding 2012 WUL thresholds.

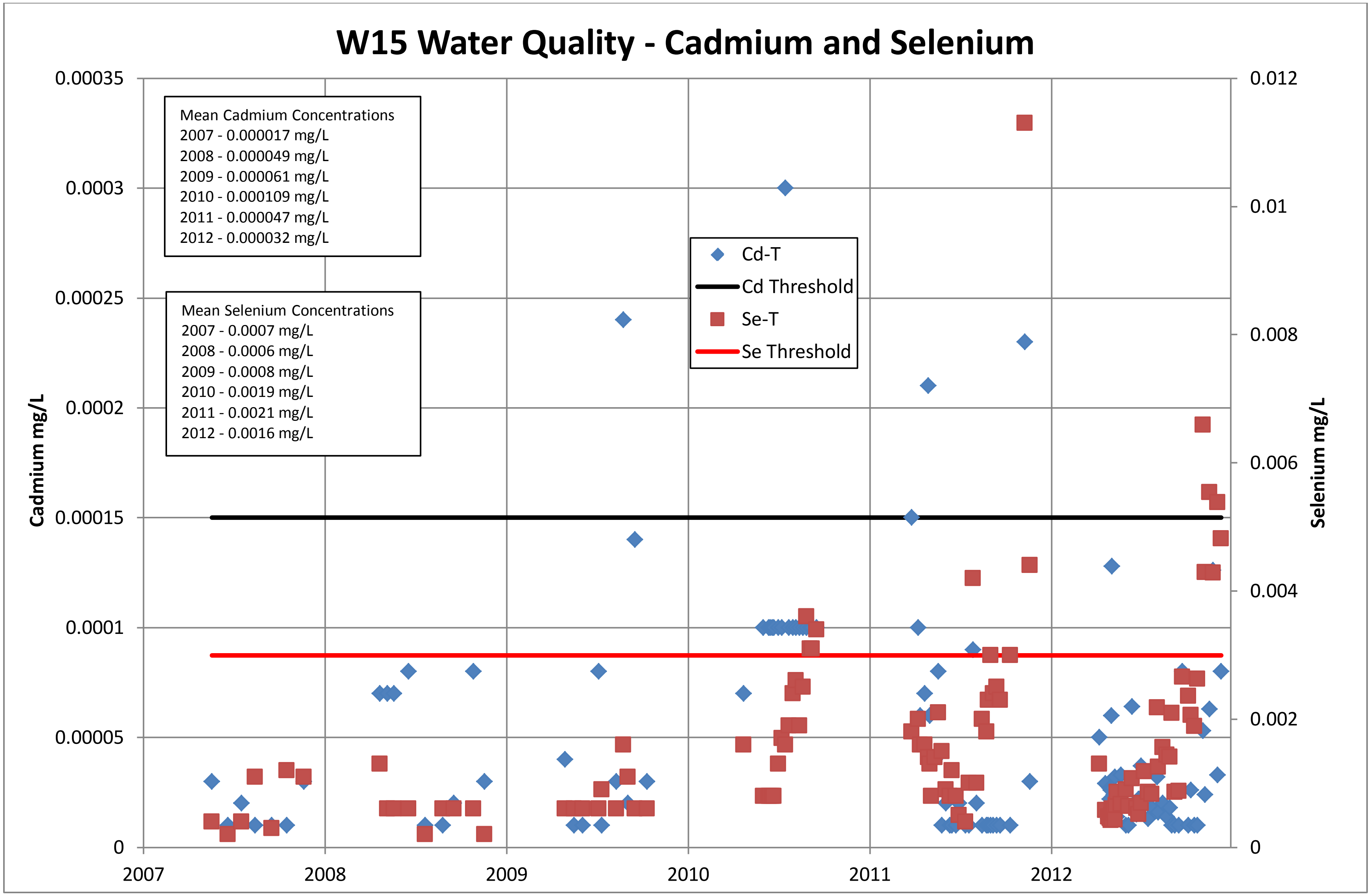

Figure 5-8: 2007 – 2012 W15 water quality for cadmium and selenium with corresponding 2012 WUL thresholds.

5.1.11 W16 – Water Storage Pond

Table 5-12 summarizes water quality results from station W16 from 2006 to 2012; 70 water quality samples were taken in 2012. The 2006-2012 W16 results for parameters copper, aluminum, cadmium and selenium are further displayed in Figures 5-9 and 5-10.

Table 5-12: 2006 – 2012 W16 water quality results summary table.

W16	Detection	2006 Summary Statistics			2007 Summary Statistics			2008 Summary Statistics			2009 Summary Statistics		
Physical Parameters	Limit	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
pH		7.73	7.3	8.27	7.85	7.5	8.76	7.55	7.1	7.9	7.54	7.1	7.9
Total Suspended Solids (mg/L)	1	76	2	181	4	1	28	12	1	57	11	1	57
Nutrients (mg/L)													
Ammonial Nitrogen	0.005	0.264	0.004	2.000	0.530	0.070	0.930	0.367	0.025	0.940	0.350	0.025	0.940
Nitrate Nitrogen	0.02	*	*	*	*	*	*	*	*	*	*	*	*
Nitrite Nitrogen	0.005	*	*	*	*	*	*	*	*	*	*	*	*
Total Metals (mg/L)													
Aluminum T-Al	0.005	1.243	0.012	6.060	0.213	0.029	1.960	0.470	0.040	3.710	0.420	0.005	3.710
Arsenic T-As	0.0001	0.0012	0.0005	0.0022	0.0007	0.0003	0.0010	0.0007	0.0001	0.0022	0.0007	0.0001	0.0022
Cadmium T-Cd	0.00001	0.00004	0.00002	0.00009	0.00003	0.00001	0.00009	0.00007	0.00002	0.00019	0.00007	0.00002	0.00019
Chromium T-Cr	0.001	0.003	0.0006	0.007	0.001	0.0003	0.006	0.001	0.0002	0.003	0.001	0.0002	0.003
Copper T-Cu	0.0002	0.019	0.003	0.100	0.038	0.000	0.082	0.120	0.051	0.468	0.112	0.051	0.468
Iron T-Fe	0.005	2.450	0.100	8.200	0.337	0.050	2.600	1.600	0.630	3.020	1.580	0.300	3.020
Lead T-Pb	0.0002	0.0006	0.0002	0.0020	0.0003	0.0001	0.0024	0.0003	0.0001	0.0010	0.0003	0.0001	0.0012
Molybdenum T-Mo	0.001	*	*	*	*	*	*	*	*	*	*	*	*
Nickel T-Ni	0.001	0.004	0.002	0.008	0.002	0.000	0.005	0.006	0.001	0.020	0.007	0.001	0.025
Selenium T-Se	0.0001	*	*	*	*	*	*	*	*	*	*	*	*
Zinc T-Zn	0.005	0.013	0.003	0.033	0.015	0.005	0.035	0.021	0.008	0.034	0.022	0.008	0.034

W16	Detection	2010 Summary Statistics			2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters	Limit	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Min	Max
pH		8.13	7.87	8.34	8.00	7.32	8.36	7.9	6.8	9.0	6.81	9.03
Total Suspended Solids (mg/L)	1	3	1	19	6	1	37	10	1	60	1	60
Nutrients (mg/L)												
Ammonial Nitrogen	0.005	0.280	0.005	0.940	0.11	0.01	0.52	0.0314	0.0055	0.2100	0.0055	0.5230
Nitrate Nitrogen	0.02	*	*	*	6.099	0.63	16.6	2.019	0.113	4.950	0.11	16.60
Nitrite Nitrogen	0.005	*	*	*	0.05	0.01	0.29	0.012	0.001	0.048	0.001	0.291
Total Metals (mg/L)												
Aluminum T-Al	0.005	0.110	0.035	0.589	0.167	0.029	0.657	0.434	0.009	2.680	0.009	2.680
Arsenic T-As	0.0001	0.0006	0.0004	0.0009	0.0004	0.0001	0.0008	0.0004	0.0001	0.0008	0.0001	0.0008
Cadmium T-Cd	0.00001	0.00010	0.00004	0.00013	0.00005	0.00001	0.00045	0.00003	0.00001	0.00023	0.00001	0.00045
Chromium T-Cr	0.001	0.002	0.0010	0.002	0.001	0.001	0.001	0.001	0.000	0.002	0.00013	0.002
Copper T-Cu	0.0002	0.059	0.029	0.131	0.050	0.027	0.268	0.0413	0.0175	0.1430	0.0175	0.2680
Iron T-Fe	0.005	0.226	0.083	0.763	0.551	0.091	7.760	0.645	0.033	3.550	0.033	7.760
Lead T-Pb	0.0002	0.0003	0.0002	0.0008	0.0003	0.0002	0.0025	0.0005	0.0000	0.0011	0.0000	0.0025
Molybdenum T-Mo	0.001	*	*	*	0.008	0.002	0.024	0.004	0.001	0.007	0.001	0.024
Nickel T-Ni	0.001	0.002	0.001	0.006	0.002	0.001	0.003	0.001	0.001	0.008	0.001	0.008
Selenium T-Se	0.0001	*	*	*	0.0018	0.0003	0.0053	0.0008	0.0001	0.0035	0.0001	0.0053
Zinc T-Zn	0.005	0.009	0.005	0.010	0.007	0.005	0.027	0.009	0.003	0.023	0.003	0.027

* not available

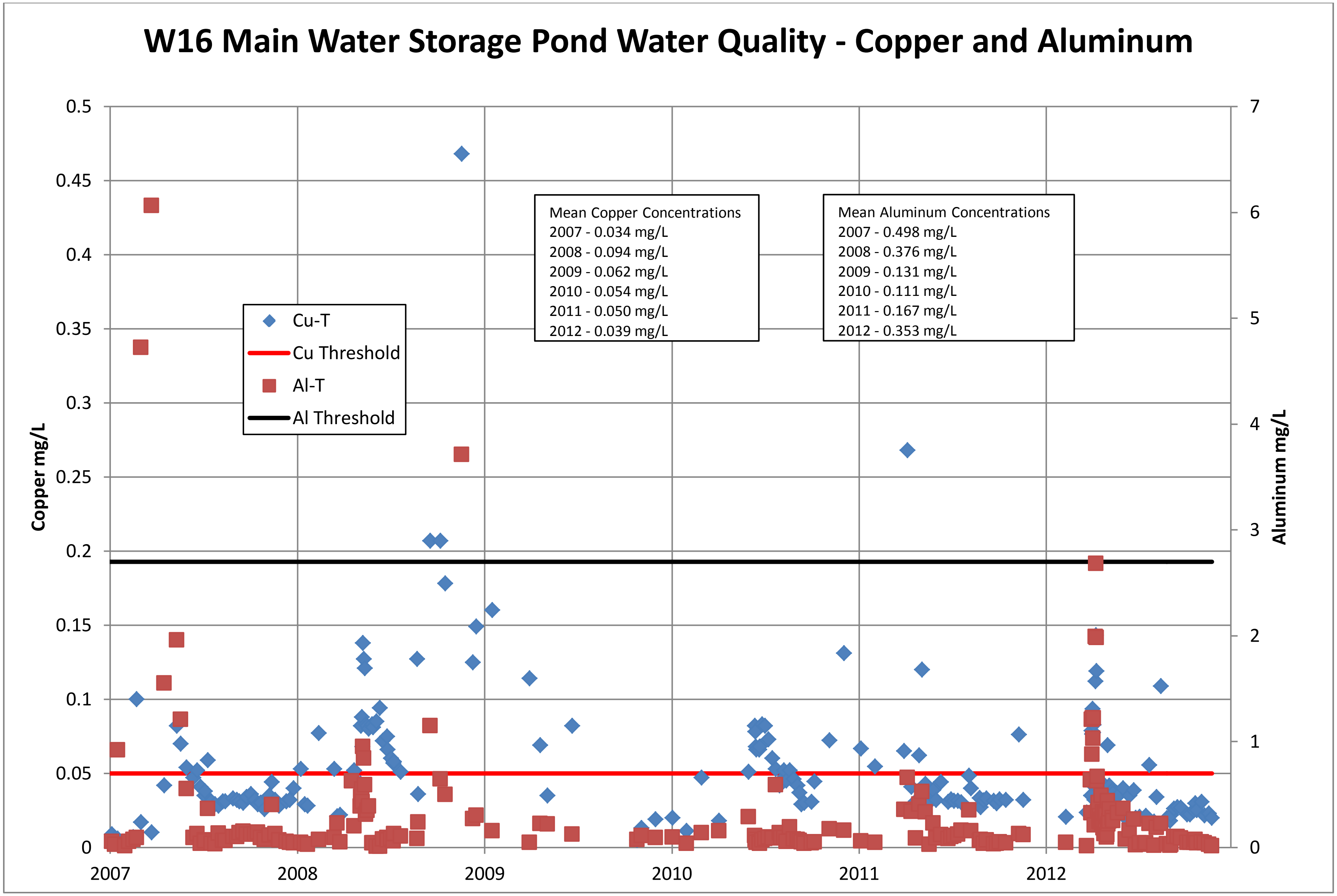

Figure 5-9: 2007 – 2012 W16 water quality for copper and aluminum with corresponding 2012 WUL thresholds.

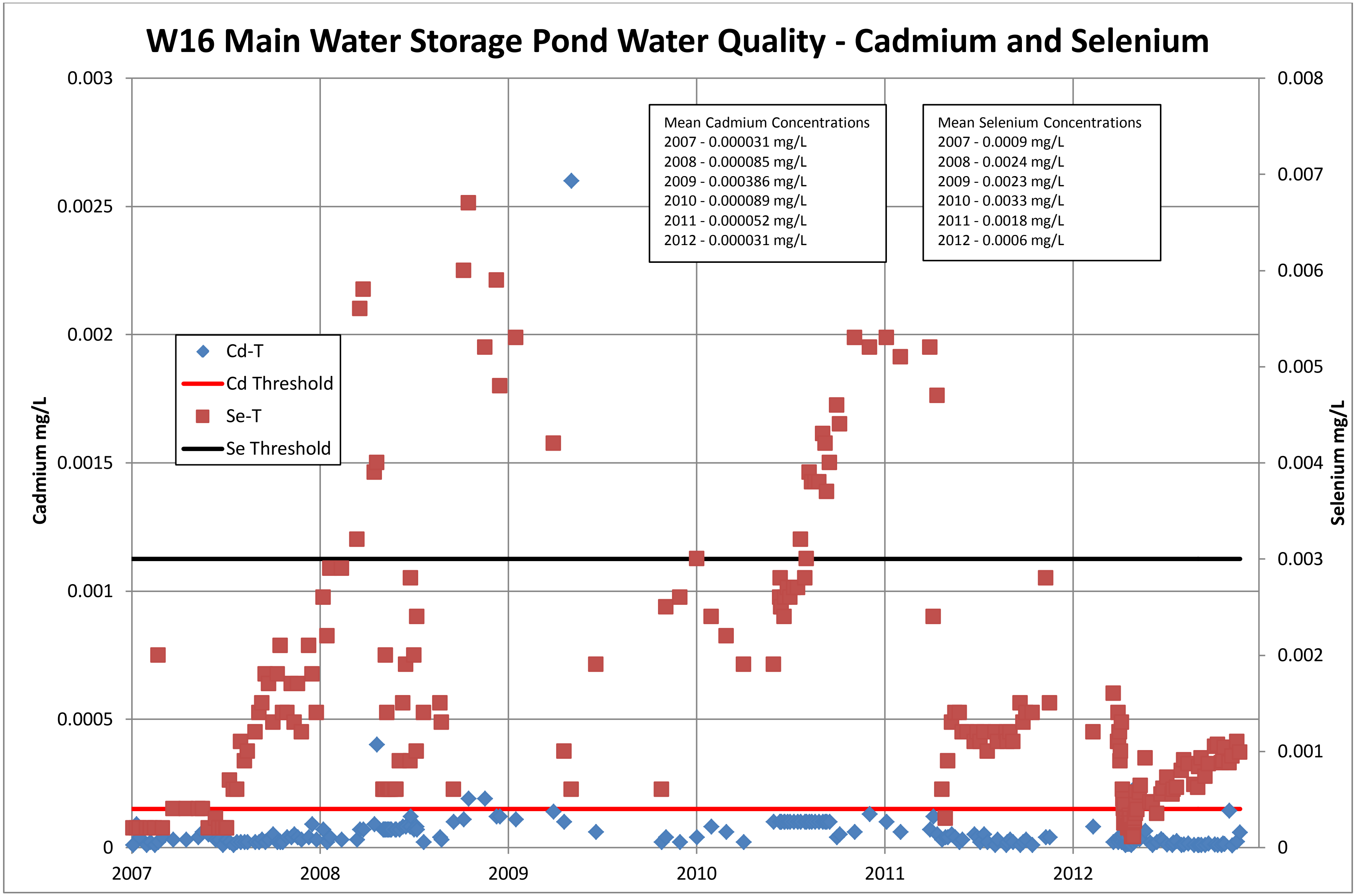

Figure 5-10: 2007 – 2012 W16 water quality for cadmium and selenium with corresponding 2012 WUL thresholds.

5.1.12 W30 – Headwaters Minto Creek (northwest fork)

Table 5-13 summarizes water quality results from station W30 for 2011 and 2012; 8 water quality samples were taken in 2012.

Table 5-13: 2011 – 2012 W30 water quality results summary table.

W30	Detection Limit	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.88	7.49	8.08	7.19	2.51	8.27	2.51	8.27
Total Suspended Solids (mg/L)	1	4	1	14	5	1.3	14.4	1	14
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	0.0528	0.0300	0.0740	0.1701	0.0320	0.5600	0.0300	0.5600
Nitrate Nitrogen	0.02	1.4	1.0	2.0	2.4	0.7	6.6	0.68	6.58
Nitrite Nitrogen	0.005	0.023	0.006	0.045	0.040	0.009	0.100	0.006	0.100
Total Metals (mg/L)									
Aluminum T-Al	0.005	0.263	0.045	0.858	0.075	0.018	0.177	0.018	0.858
Arsenic T-As	0.0001	0.0007	0.0005	0.0009	0.0007	0.0005	0.0013	0.0005	0.0013
Cadmium T-Cd	0.00001	0.00003	0.00001	0.00008	0.00002	0.00001	0.00003	0.00001	0.00008
Chromium T-Cr	0.001	0.001	BDL	0.001	0.001	0.001	0.001	BDL	0.001
Copper T-Cu	0.0002	0.0358	0.0214	0.0820	0.0296	0.0177	0.0513	0.0177	0.0820
Iron T-Fe	0.005	0.501	0.198	1.23	0.455	0.0797	2.15	0.080	2.150
Lead T-Pb	0.0002	0.0002571	BDL	0.0005	0.000325	0.0003	0.00035	BDL	0.0005
Molybdenum T-Mo	0.001	0.0017143	BDL	0.004	0.001825	0.0012	0.0027	BDL	0.004
Nickel T-Ni	0.001	0.001	BDL	0.002	0.008	0.002	0.013	BDL	0.013
Selenium T-Se	0.0001	0.0022	0.0005	0.0047	0.0014	0.0004	0.0039	0.0004	0.0047
Zinc T-Zn	0.005	0.007	BDL	0.015	0.013	0.011	0.015	BDL	0.015

5.1.13 W33 – Above Tailings Diversion Ditches

Table 5-14 summarizes water quality results from station W33 for 2011 and 2012; 7 water quality samples were taken in 2012.

Table 5-14: 2011 - 2012 W33 water quality results summary table.

W32	Detection Limit	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.92	7.68	8.3	7.62	7.13	8.01	7.13	8.30
Total Suspended Solids (mg/L)	1	8	2	15	38	1.9	198	2	198
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	0.155	0.012	0.299	0.069	0.008	0.180	0.0083	0.2990
Nitrate Nitrogen	0.02	278	15	1030	0	0	0	0.02	1030.00
Nitrite Nitrogen	0.005	0.201	BDL	0.770	0.005	0.005	0.005	BDL	0.770
Total Metals (mg/L)									
Aluminum T-Al	0.005	0.351	0.080	0.730	0.696	0.049	3.940	0.049	3.940
Arsenic T-As	0.0001	0.0005	0.0004	0.0009	0.0007	0.0003	0.0025	0.0003	0.0025
Cadmium T-Cd	0.00001	0.00006	0.00004	0.00009	0.00003	0.00002	0.00007	0.00002	0.00009
Chromium T-Cr	0.001	BDL	BDL	BDL	0.0065	0.0065	0.0065	BDL	0.007
Copper T-Cu	0.0002	0.041	0.011	0.091	0.026	0.011	0.089	0.0105	0.0909
Iron T-Fe	0.005	0.6305	0.219	1.34	1.37	0.27	6.54	0.219	6.540
Lead T-Pb	0.0002	0.0002	BDL	0.0003	0.0010	0.00022	0.00173	BDL	0.0017
Molybdenum T-Mo	0.001	0.012	0.003	0.033	0.001	0.001	0.002	0.001	0.033
Nickel T-Ni	0.001	0.001	0.001	0.001	0.0029	0.0015	0.0066	0.001	0.007
Selenium T-Se	0.0001	0.0085	0.0022	0.0135	0.000184	0.00013	0.00023	0.0001	0.0135
Zinc T-Zn	0.005	0.0055	BDL	0.006	0.014	0.014	0.014	BDL	0.014

5.1.14 W35A – Storm Water Collection Point – Top of South Diversion Ditch

Table 5-15 summarizes water quality results from station W35a for 2011 and 2012; 16 water quality samples were taken in 2012.

Table 5-15: 2011 - 2012 W35A water quality results summary table.

W35A	Detection Limit	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.74	7.18	8.10	7.69	7.00	8.72	7.00	8.72
Total Suspended Solids (mg/L)	1	5	1	12	309	1	1840	1	1840
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	0.032	0.007	0.170	0.0666	0.0064	0.8900	0.0064	0.8900
Nitrate Nitrogen	0.02	3.631	BDL	16.900	2.764	0.281	7.580	BDL	16.90
Nitrite Nitrogen	0.005	0.031	BDL	0.181	0.093	0.021	0.195	BDL	0.195
Total Metals (mg/L)									
Aluminum T-Al	0.005	0.151	0.040	0.309	4.917	0.029	70.600	0.029	70.600
Arsenic T-As	0.0001	0.0004	0.0002	0.0007	0.0014	0.0002	0.0157	0.0002	0.0157
Cadmium T-Cd	0.00001	0.00038	BDL	0.00280	0.00014	0.00001	0.00126	BDL	0.00280
Chromium T-Cr	0.001	BDL	BDL	BDL	0.020	0.010	0.030	BDL	0.030
Copper T-Cu	0.0002	0.0322	0.0077	0.1130	0.4817	0.0071	6.6900	0.0071	6.6900
Iron T-Fe	0.005	0.547	0.156	2.170	8.789	0.126	130.000	0.126	130.000
Lead T-Pb	0.0002	BDL	BDL	BDL	0.0073	0.0003	0.0276	BDL	0.0276
Molybdenum T-Mo	0.001	0.002	BDL	0.011	0.003	0.001	0.008	BDL	0.011
Nickel T-Ni	0.001	0.001	BDL	0.002	0.003	0.001	0.021	BDL	0.021
Selenium T-Se	0.0001	0.000775	BDL	0.0054	0.0007	0.0001	0.0031	BDL	0.0054
Zinc T-Zn	0.005	0.009	BDL	0.039	0.106	0.007	0.512	BDL	0.512

5.1.15 W35B – Storm Water Collection Point – Bottom of South Diversion Ditch

Table 5-16 summarizes water quality results from station W35b for 2011 and 2012; 6 water quality samples were taken in 2012.

Table 5-16: 2011 – 2012 W35B water quality results summary table.

W35B	Detection Limit	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.87	7.23	8.13	7.85	7.49	8.38	7.23	8.38
Total Suspended Solids (mg/L)	1	14	BDL	66	14	3	36	BDL	66
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	0.268	0.007	2	2.0600	0.0100	12.0000	0.0070	12.0000
Nitrate Nitrogen	0.02	5.49	0.02	38	24.058	0.146	95.400	0.02	95.40
Nitrite Nitrogen	0.005	0.297	0.005	2.03	0.894	0.006	2.670	0.005	2.670
Total Metals (mg/L)									
Aluminum T-Al	0.005	0.403	0.044	1.28	0.359	0.082	1.070	0.044	1.280
Arsenic T-As	0.0001	0.0005	0.0002	0.0008	0.0006	0.0003	0.0016	0.0002	0.0016
Cadmium T-Cd	0.00001	0.00007	0.00001	0.00026	0.00003	0.00001	0.00008	0.00001	0.00026
Chromium T-Cr	0.001	BDL	BDL	BDL	0.001	0.001	0.001	BDL	0.001
Copper T-Cu	0.0002	0.0757	0.0188	0.218	0.1117	0.0306	0.4290	0.0188	0.4290
Iron T-Fe	0.005	0.714	0.122	2.07	0.809	0.221	2.190	0.122	2.190
Lead T-Pb	0.0002	0.0003	BDL	0.0009	0.0005	0.0005	0.0005	BDL	0.0009
Molybdenum T-Mo	0.001	0.003	BDL	0.015	0.004	0.001	0.013	BDL	0.015
Nickel T-Ni	0.001	0.002	0.001	0.002	0.001	0.001	0.002	0.001	0.002
Selenium T-Se	0.0001	0.0007	0.0001	0.0044	0.0017	0.0001	0.0079	0.0001	0.0079
Zinc T-Zn	0.005	0.015	0.005	0.037	0.007	0.006	0.007	0.005	0.037

5.1.16 W36 – Minto Creek Detention Structure Pond

Table 5-17 summarizes water quality results from station W36 for 2011 and 2012; 14 water quality samples were taken in 2012.

Table 5-17: 2011 – 2012 W36 water quality results summary table.

W36	Detection Limit	2012 Summary Statistics		
Physical Parameters		Mean	Min	Max
pH		7.80	7.48	8.10
Total Suspended Solids (mg/L)	1	54	3	514
Nutrients (mg/L)				
Ammonial Nitrogen	0.005	0.076	0.006	0.180
Nitrate Nitrogen	0.02	9.20	4.65	13.90
Nitrite Nitrogen	0.005	0.095	0.028	0.244
Total Metals (mg/L)				
Aluminum T-Al	0.005	0.962	0.034	9.210
Arsenic T-As	0.0001	0.0007	0.0004	0.0020
Cadmium T-Cd	0.00001	0.00009	0.00004	0.00041
Chromium T-Cr	0.001	0.003	0.001	0.004
Copper T-Cu	0.0002	0.1975	0.0463	1.7100
Iron T-Fe	0.005	1.621	0.217	14.900
Lead T-Pb	0.0002	0.002	0.000	0.008
Molybdenum T-Mo	0.001	0.008	0.006	0.009
Nickel T-Ni	0.001	0.002	0.001	0.006
Selenium T-Se	0.0001	0.0040	0.0022	0.0060
Zinc T-Zn	0.005	0.014	0.005	0.084

5.1.17 W42 – Storm Water Collection Sump – North side of Mine Access Road 0.5 km

Table 5-18 summarizes water quality results from station W42 for 2011 and 2012; 24 water quality samples were taken in 2012.

Table 5-18: 2011 – 2012 W42 water quality results summary table.

W42	Detection Limit	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.77	7.41	8.00	7.78	7.24	8.29	7.24	8.29
Total Suspended Solids (mg/L)	1	25	4	81	25	1	257	1	257
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	0.034	BDL	0.250	0.0499	0.0082	0.2600	BDL	0.2600
Nitrate Nitrogen	0.02	0.18	BDL	0.79	0.152	0.037	0.571	BDL	0.79
Nitrite Nitrogen	0.005	0.018	BDL	0.070	0.024	0.005	0.082	BDL	0.082
Total Metals (mg/L)									
Aluminum T-Al	0.005	1.154	0.191	3.330	0.988	0.010	11.500	0.010	11.500
Arsenic T-As	0.0001	0.0006	0.0004	0.0012	0.0004	0.0001	0.0028	0.0001	0.0028
Cadmium T-Cd	0.00001	0.00005	0.00002	0.00010	0.00004	0.00001	0.00019	0.00001	0.00019
Chromium T-Cr	0.001	0.002	0.001	0.003	0.007	0.007	0.007	0.001	0.007
Copper T-Cu	0.0002	0.0981	0.0334	0.231	0.0652	0.0079	0.5750	0.0079	0.5750
Iron T-Fe	0.005	1.725	0.346	4.560	1.477	0.029	16.000	0.029	16.000
Lead T-Pb	0.0002	0.0005	BDL	0.0011	0.0021	0.0004	0.0039	BDL	0.0039
Molybdenum T-Mo	0.001	0.002	0.001	0.004	0.002	0.001	0.004	0.001	0.004
Nickel T-Ni	0.001	0.002	0.001	0.003	0.003	0.001	0.007	0.001	0.007
Selenium T-Se	0.0001	0.0002	BDL	0.0005	0.0002	0.0001	0.0005	BDL	0.0005
Zinc T-Zn	0.005	0.009	BDL	0.019	0.032	0.007	0.058	BDL	0.058

5.1.18 W43 – Storm Water Collection Sump – North side of Mine Access Road at Water Storage Pond

Table 5-19 summarizes water quality results from station W43 for 2011 and 2012; 9 water quality samples were taken in 2012.

Table 5-19: 2011 – 2012 W43 water quality results summary table.

W43	Detection	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters	Limit	Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.72	7.50	7.95	7.94	7.82	8.11	7.50	8.11
Total Suspended Solids (mg/L)	1	58	BDL	170	589	1	1790	BDL	1790
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	0.029	BDL	0.086	0.0403	0.0069	0.1100	BDL	0.1100
Nitrate Nitrogen	0.02	0.86	0.61	1.26	0.395	0.177	0.581	0.177	1.260
Nitrite Nitrogen	0.005	0.025	BDL	0.075	0.008	0.005	0.012	BDL	0.075
Total Metals (mg/L)									
Aluminum T-Al	0.005	3.514	0.028	8.630	20.857	0.012	90.800	0.012	90.800
Arsenic T-As	0.0001	0.0011	BDL	0.0026	0.0049	0.0003	0.0123	BDL	0.0123
Cadmium T-Cd	0.00001	0.00007	BDL	0.00014	0.00041	0.00001	0.00126	BDL	0.00126
Chromium T-Cr	0.001	0.003	BDL	0.007	0.022	0.002	0.046	BDL	0.046
Copper T-Cu	0.0002	0.1514	0.0154	0.451	1.6305	0.0087	5.9500	0.0087	5.9500
Iron T-Fe	0.005	5.04	0.041	13.7	39.848	0.019	172.000	0.019	172.000
Lead T-Pb	0.0002	0.0016	BDL	0.0033	0.0159	0.0009	0.0303	BDL	0.0303
Molybdenum T-Mo	0.001	0.002	BDL	0.005	0.003	0.002	0.005	BDL	0.005
Nickel T-Ni	0.001	0.003	BDL	0.006	0.017	0.002	0.034	BDL	0.034
Selenium T-Se	0.0001	0.0007	0.0001	0.0019	0.0009	0.0002	0.0028	0.0001	0.0028
Zinc T-Zn	0.005	0.051	BDL	0.245	0.238	0.012	0.600	BDL	0.600

5.1.19 W44 – Area 2 Underground Mine Inflows

Water quality site W44 was not established in 2012 as no water was discharged from the underground workings in 2012.

5.1.20 W45 – Area 2 Pit

Table 5-20 summarizes water quality results from station W45 for 2012; 4 water quality samples were taken in 2012.

Table 5-20: 2012 W45 water quality results summary table.

W45	Detection Limit	2012 Summary Statistics		
Physical Parameters		Mean	Min	Max
pH		7.68	7.50	7.83
Total Suspended Solids (mg/L)	1	76	2	291
Nutrients (mg/L)				
Ammonial Nitrogen	0.005	6.575	3.700	9.600
Nitrate Nitrogen	0.02	41.08	26.40	55.90
Nitrite Nitrogen	0.005	1.148	0.621	2.270
Total Metals (mg/L)				
Aluminum T-Al	0.005	0.527	0.019	1.860
Arsenic T-As	0.0001	0.0017	0.0012	0.0023
Cadmium T-Cd	0.00001	0.00002	0.00001	0.00003
Chromium T-Cr	0.001	0.001	0.001	0.001
Copper T-Cu	0.0002	0.0934	0.0485	0.1450
Iron T-Fe	0.005	0.802	0.070	2.690
Lead T-Pb	0.0002	0.001	0.001	0.001
Molybdenum T-Mo	0.001	0.029	0.013	0.044
Nickel T-Ni	0.001	0.002	0.001	0.002
Selenium T-Se	0.0001	0.0107	0.0033	0.0298
Zinc T-Zn	0.005	0.012	0.012	0.012

5.1.21 W46 – Minto Creek, Downstream of W7 and W6

Table 5-21 summarizes water quality results from station W46 for 2012; 4 water quality samples were taken in 2012.

Table 5-21: 2012 W46 water quality results summary table.

W46	Detection Limit	2012 Summary Statistics		
Physical Parameters		Mean	Min	Max
pH		7.87	7.81	8.00
Total Suspended Solids (mg/L)	1	33	7	70
Nutrients (mg/L)				
Ammonial Nitrogen	0.005	0.019	0.010	0.027
Nitrate Nitrogen	0.02	0.18	0.13	0.20
Nitrite Nitrogen	0.005	0.005	0.005	0.005
Total Metals (mg/L)				
Aluminum T-Al	0.005	0.353	0.057	0.618
Arsenic T-As	0.0001	0.0008	0.0005	0.0011
Cadmium T-Cd	0.00001	0.00001	0.00001	0.00001
Chromium T-Cr	0.001	0.001	0.001	0.001
Copper T-Cu	0.0002	0.0024	0.0014	0.0035
Iron T-Fe	0.005	1.190	0.563	1.660
Lead T-Pb	0.0002	0.000	0.000	0.000
Molybdenum T-Mo	0.001	0.001	0.001	0.002
Nickel T-Ni	0.001	0.002	0.002	0.003
Selenium T-Se	0.0001	0.0002	0.0002	0.0002
Zinc T-Zn	0.005	0.005	0.005	0.005

5.1.22 W47 – Area 118 Pit Water

Area 118 was not developed in 2012 and therefore water quality site W47 was not established.

5.1.23 W50 – Minto Creek, 50m Downstream of the Toe of the Water Storage Pond Dam

Table 5-22 summarizes water quality results from station W50 from 2009 to 2012; 27 water quality samples were taken in 2012. The 2009-2012 W50 results for parameters copper, aluminum, cadmium and selenium are further displayed in Figures 5-11 and 5-12.

Table 5-22: 2009 – 2012 W50 water quality results summary table.

W50	Detection	2009 Summary Statistics			2010 Summary Statistics			2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters	Limit	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.97	7.92	8.04	8.17	8.04	8.26	7.66	7.17	8.27	7.7	7.3	8.0	7.25	8.27
Total Suspended Solids (mg/L)	1	14	1	34	1	1	3	10	2	27	7	2	30	2	30
Nutrients (mg/L)															
Ammonial Nitrogen	0.005	0.025	0.025	0.025	0.287	0.005	1.000	0.01	0.006	0.018	0.0402	0.0062	0.6420	0.0062	0.6420
Nitrate Nitrogen	0.02	*	*	*	*	*	*	1.28	0.02	3.1	3.980	1.600	5.150	1.60	5.15
Nitrite Nitrogen	0.005	*	*	*	*	*	*	0.01	0.005	0.005	0.008	0.005	0.012	0.005	0.012
Total Metals (mg/L)															
Aluminum T-Al	0.005	0.635	0.008	2.400	0.096	0.010	0.332	0.25	0.015	0.664	0.195	0.028	0.772	0.028	0.772
Arsenic T-As	0.0001	0.0010	0.0004	0.0019	0.0004	0.0003	0.0005	0.0004	0.0003	0.0005	0.0005	0.0004	0.0006	0.0004	0.0006
Cadmium T-Cd	0.00001	0.00004	0.00002	0.00007	0.00005	0.00001	0.00010	0.00003	0.00001	0.00004	0.00002	0.00001	0.00005	0.00001	0.00005
Chromium T-Cr	0.001	0.002	0.0005	0.005	0.001	0.0010	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.0012	0.002
Copper T-Cu	0.0002	0.054	0.008	0.103	0.007	0.005	0.014	0.0205	0.0040	0.0417	0.0276	0.0068	0.0393	0.0068	0.0417
Iron T-Fe	0.005	1.140	0.020	3.850	0.023	0.005	0.088	0.403	0.025	1.220	0.307	0.055	0.938	0.055	1.220
Lead T-Pb	0.0002	0.0006	0.0001	0.0017	0.0002	0.0002	0.0002	0.0003	0.0002	0.0003	0.0003	0.0002	0.0004	0.0002	0.0004
Molybdenum T-Mo	0.001	*	*	*	*	*	*	0.005	0.001	0.008	0.006	0.004	0.007	0.004	0.008
Nickel T-Ni	0.001	0.006	0.002	0.015	0.001	0.001	0.001	0.002	0.001	0.003	0.001	0.001	0.002	0.001	0.003
Selenium T-Se	0.0001	*	*	*	*	*	*	0.0004	0.0001	0.0009	0.0015	0.0004	0.0032	0.0004	0.0032
Zinc T-Zn	0.005	0.018	0.008	0.033	0.008	0.005	0.013	0.007	0.005	0.010	0.006	0.005	0.010	0.005	0.010

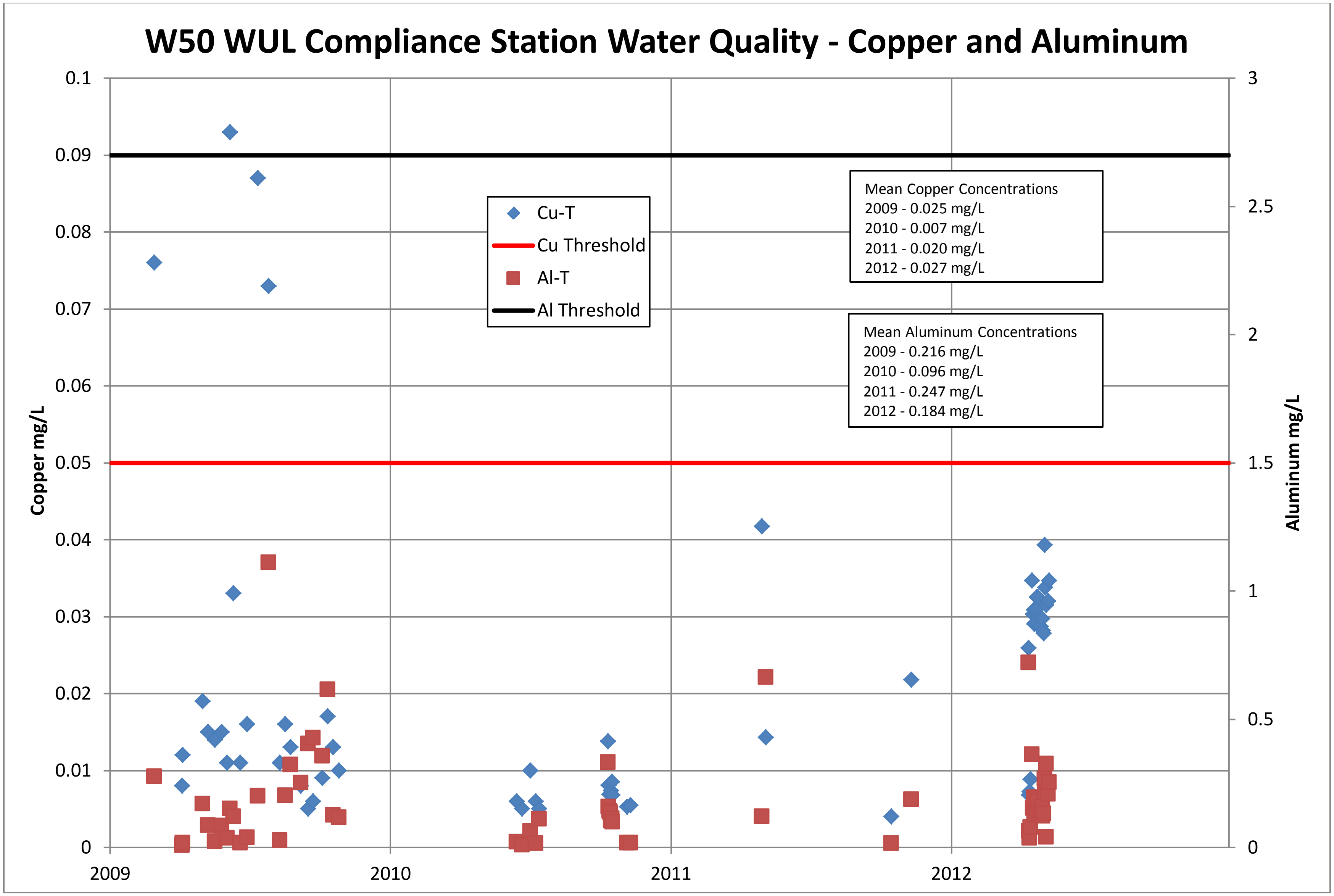

Figure 5-11: 2009 – 2012 W50 water quality for copper and aluminum with corresponding 2012 WUL thresholds.

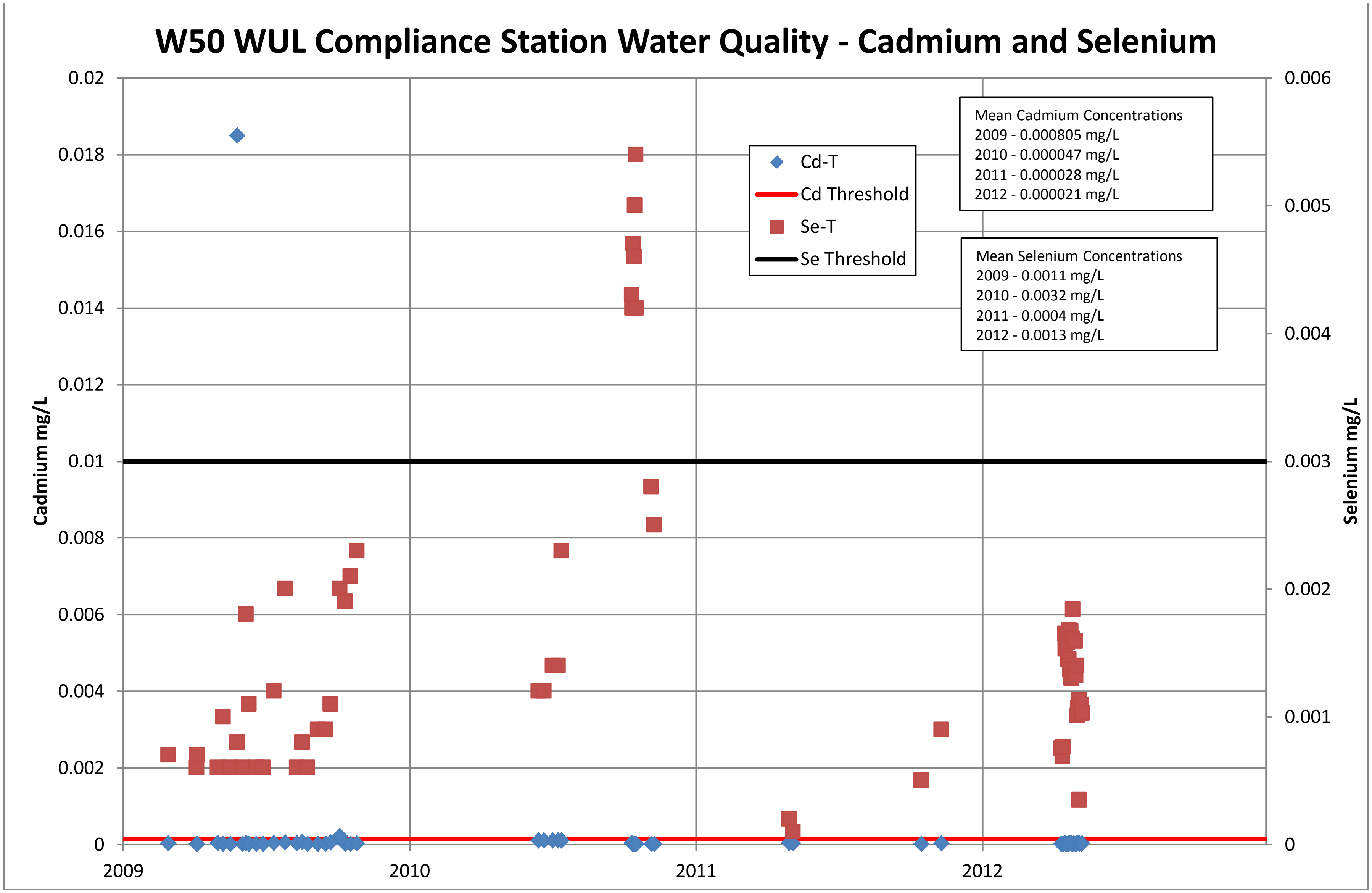

Figure 5-12: 2009 – 2012 W50 water quality for cadmium and selenium with corresponding 2012 WUL thresholds.

5.1.24 MC-1 – Minto Creek Upstream of Canyon near Km 8 on Mine Access Road

Table 5-23 summarizes water quality results from station MC-1 for 2011 and 2012; 37 water quality samples were taken in 2012.

Table 5-23: 2011 – 2012 MC-1 water quality results summary table.

MC-1	Detection Limit	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Min	Max
pH		8.05	7.75	8.26	7.87	7.31	8.60	7.31	8.60
Total Suspended Solids (mg/L)	1	121	3	660	95	BDL	631	BDL	660
Nutrients (mg/L)							0		
Ammonial Nitrogen	0.005	0.031	BDL	0.230	0.0357	0.0050	0.1200	BDL	0.2300
Nitrate Nitrogen	0.02	0.16	0.08	0.40	0.173	0.005	0.953	0.01	0.95
Nitrite Nitrogen	0.005	0.010	BDL	0.050	0.006	0.001	0.024	BDL	0.050
Total Metals (mg/L)							0		
Aluminum T-Al	0.005	2.676	0.092	14.900	1.927	0.010	14.100	0.010	14.900
Arsenic T-As	0.0001	0.0020	0.0008	0.0073	0.0015	0.0005	0.0069	0.0005	0.0073
Cadmium T-Cd	0.00001	0.00010	0.00001	0.00045	0.00005	0.00001	0.00025	0.00001	0.00045
Chromium T-Cr	0.001	0.006	BDL	0.033	0.004	0.001	0.026	BDL	0.033
Copper T-Cu	0.0002	0.0113	0.0023	0.0417	0.0075	0.0015	0.0329	0.0015	0.0417
Iron T-Fe	0.005	4.79	0.57	23.90	3.414	0.035	22.300	0.035	23.900
Lead T-Pb	0.0002	0.0013	0.0002	0.0065	0.0010	0.0002	0.0058	0.0002	0.0065
Molybdenum T-Mo	0.001	0.001	BDL	0.002	0.001	0.001	0.002	BDL	0.002
Nickel T-Ni	0.001	0.007	0.002	0.033	0.005	0.001	0.026	0.001	0.033
Selenium T-Se	0.0001	0.0002	0.0001	0.0005	0.0003	BDL	0.0010	BDL	0.0010
Zinc T-Zn	0.005	0.013	BDL	0.056	0.010	0.005	0.055	BDL	0.056

5.1.25 WC – Convergence Point for W15 and W35 Inflows

No samples were collected at water quality site WC, however, source water was sampled regularly when flowing.

5.2 Minto Creek Hydrology

During the 2012 reporting period Minto Mine maintained and collected data from three hydrometric stations along Minto Creek. The hydrometric stations are located at the following water quality stations:

- W3 (flume downstream of Water Storage Pond);
- MC-1 (located in Minto Canyon – mid catchment); and
- W1 (located approximately 1km upstream of Yukon River – lower catchment).

For data collection, Solinst water level loggers and barometer loggers were used in conjunction with staff gauge readings and manual flow measurements. For details on the results of Minto Creek hydrology see the Minto Creek and McGinty Creek Surface Water Hydrology Update Memorandum in Appendix B.

5.3 Yukon River Monitoring Program

The Yukon River Monitoring program includes water quality sampling at locations on the Yukon River upstream and downstream of the Minto Creek confluence.

5.3.1 W4 – Yukon River, Upstream of the confluence with Minto Creek

Table 5-24 summarizes water quality results from station W4 for 2011 and 2012; 30 water quality samples were taken in 2012.

Table 5-24: 2011 – 2012 W4 water quality results summary table.

W4	Detection Limit	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.89	7.56	8.07	7.75	6.28	9.25	6.28	9.25
Total Suspended Solids (mg/L)	1	52	3	240	42	BDL	270	BDL	270
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	0.015	0.006	0.059	0.0359	0.0052	0.1300	0.0052	0.1300
Nitrate Nitrogen	0.02	0.04	0.02	0.11	0.084	0.024	0.849	0.020	0.85
Nitrite Nitrogen	0.005	0.006	BDL	0.019	0.018	0.018	0.018	BDL	0.019
Total Metals (mg/L)									
Aluminum T-Al	0.005	1.214	0.069	6.330	0.880	0.008	7.950	0.008	7.950
Arsenic T-As	0.0001	0.0013	0.0003	0.0040	0.0010	0.0004	0.0067	0.0003	0.0067
Cadmium T-Cd	0.00001	0.00013	BDL	0.00204	0.00004	BDL	0.00020	BDL	0.00204
Chromium T-Cr	0.001	0.003	BDL	0.013	0.004	0.001	0.015	BDL	0.015
Copper T-Cu	0.0002	0.005	0.001	0.016	0.0033	0.0008	0.0173	0.0008	0.0173
Iron T-Fe	0.005	1.753	0.133	8.740	1.238	0.044	10.400	0.044	10.400
Lead T-Pb	0.0002	0.0009	BDL	0.0035	0.0009	0.0002	0.0045	BDL	0.0045
Molybdenum T-Mo	0.001	0.001	BDL	0.001	0.001	0.001	0.002	BDL	0.002
Nickel T-Ni	0.001	0.005	BDL	0.016	0.004	0.001	0.018	BDL	0.018
Selenium T-Se	0.0001	0.0002	0.0001	0.0002	0.0002	0.0001	0.0003	0.0001	0.0003
Zinc T-Zn	0.005	0.013	BDL	0.028	0.010	0.005	0.032	BDL	0.032

5.3.2 W5 – Yukon River, Downstream of the Confluence with Minto Creek

Table 5-25 summarizes water quality results from station W5 for 2011 and 2012; 27 water quality samples were taken in 2012.

Table 5-25: 2011 – 2012 W5 water quality results summary table.

W5	Detection Limit	2011 Summary Statistics			2012 Summary Statistics			Historic Range	
Physical Parameters		Mean	Min	Max	Mean	Min	Max	Min	Max
pH		7.91	7.58	8.10	7.86	7.44	8.37	7.44	8.37
Total Suspended Solids (mg/L)	1	49	0	340	66	7	318	0	340
Nutrients (mg/L)									
Ammonial Nitrogen	0.005	0.033	BDL	0.382	0.0328	0.0052	0.1100	BDL	0.3820
Nitrate Nitrogen	0.02	0.07	0.02	0.40	0.066	0.020	0.378	0.02	0.40
Nitrite Nitrogen	0.005	0.005	BDL	0.009	0.019	0.009	0.032	BDL	0.032
Total Metals (mg/L)									
Aluminum T-Al	0.005	1.278	0.159	11.200	1.524	0.014	8.740	0.014	11.200
Arsenic T-As	0.0001	0.0014	0.0005	0.0069	0.0013	0.0004	0.0057	0.0004	0.0069
Cadmium T-Cd	0.00001	0.00006	0.00001	0.00029	0.00006	0.00001	0.00021	0.00001	0.00029
Chromium T-Cr	0.001	0.003	BDL	0.025	0.006	0.001	0.016	BDL	0.025
Copper T-Cu	0.0002	0.0058	0.0015	0.0331	0.0044	0.0006	0.0198	0.0006	0.0331
Iron T-Fe	0.005	2.054	0.330	18.200	2.395	0.032	12.700	0.032	18.200
Lead T-Pb	0.0002	0.001	0.000	0.006	0.0012	0.0002	0.0043	0.0002	0.0058
Molybdenum T-Mo	0.001	0.001	BDL	0.002	0.001	0.001	0.002	BDL	0.002
Nickel T-Ni	0.001	0.004	BDL	0.027	0.004	0.001	0.017	BDL	0.027
Selenium T-Se	0.0001	0.0001	BDL	0.0004	0.0002	0.0001	0.0003	BDL	0.0004
Zinc T-Zn	0.005	0.008	BDL	0.051	0.015	0.005	0.036	BDL	0.051

5.4 Seepage Monitoring Program

As required by Clause 76 and 77 of the WUL Minto Mine is required to submit and implement an updated *Seepage Monitoring Plan* to assess acid rock drainage and metal leaching conditions from several sources including; ore stockpile areas, overburden dumps, waste rock dumps, DSTSF, Mill Valley , the mill area and other seepage locations. The seepage monitoring that was conducted in 2012 was carried out in accordance with version 2012-01 of the *Seepage Monitoring Plan* which was submitted to the Yukon Water Board on January 15th, 2013

The *Seepage Monitoring Plan* states that seepage surveys will be conducted twice a year, during spring runoff and in early fall, by walking the toe of each waste dump, stockpile or other area of interest; for each seepage monitoring event survey routes will be recorded using the tracking function of a Global Positioning System (GPS). Figure 5-13 displays the 2012 survey routes and monitoring locations.

Figure 5-13: 2012 Minto Mine overview with seepage surveys (in yellow) and sample locations (fall samples in red and spring samples in green).

Monitoring of seepage at several monitoring stations is a requirement of the WQSP. These stations include:W8, W8A, W17, W32, W36, W37, W38, W39 and W40. The water quality results for these routine stations are reported monthly in the Monthly Data Submissions as required by the WUL and therefore will only be summarized in this report. All laboratory results for 2012 spring and fall seepage monitoring programs are provided in Appendix C.

While a preliminary seepage survey was completed for seasonal seepage in the fall of 2011, seasonal seepage site protocols have since been refined in regards to seepage site area and location. In 2012, Minto standardized naming of seepage site locations and recorded GPS coordinates in the Minto Mine Water Quality Database. Minto will continue to monitor the seepage areas as well as continue to investigate other potential seepage locations on a semi- annual basis.

5.4.1 W8 and W8A – Eastern and Western Finger Drain Monitoring Station below DSTSF

Vertical culverts were installed at both W8 and W8A to maintain water quality monitoring at these locations during the construction of the MVFE. Since the installation of the vertical culvert at W8, water samples have been unattainable; therefore no samples were taken during the reporting period.

The 2009 to 2012 W8 and W8A water quality results are displayed in Figures 5-14 – 5-22. Water quality parameters displayed include: dissolved cadmium (Figure 5-14 and Figure 5-15), dissolved iron (Figure 5-16), dissolved selenium (Figure 5-17), ammonia (Figure 5-18 and Figure 5-19), nitrite (Figure 5-20), nitrate (Figure 5-21) and dissolved copper (Figure 5-22).

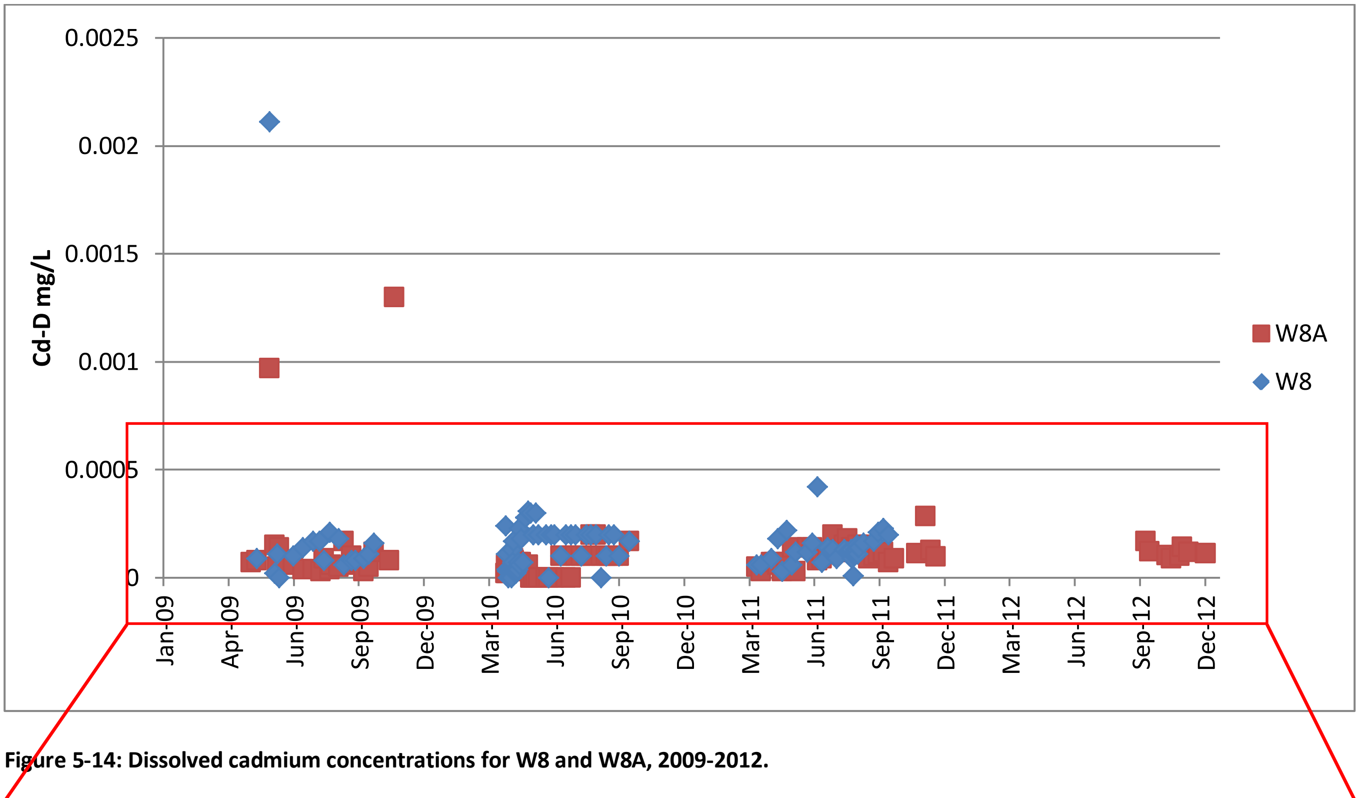

Figure 5-14: Dissolved cadmium concentrations for W8 and W8A, 2009-2012.

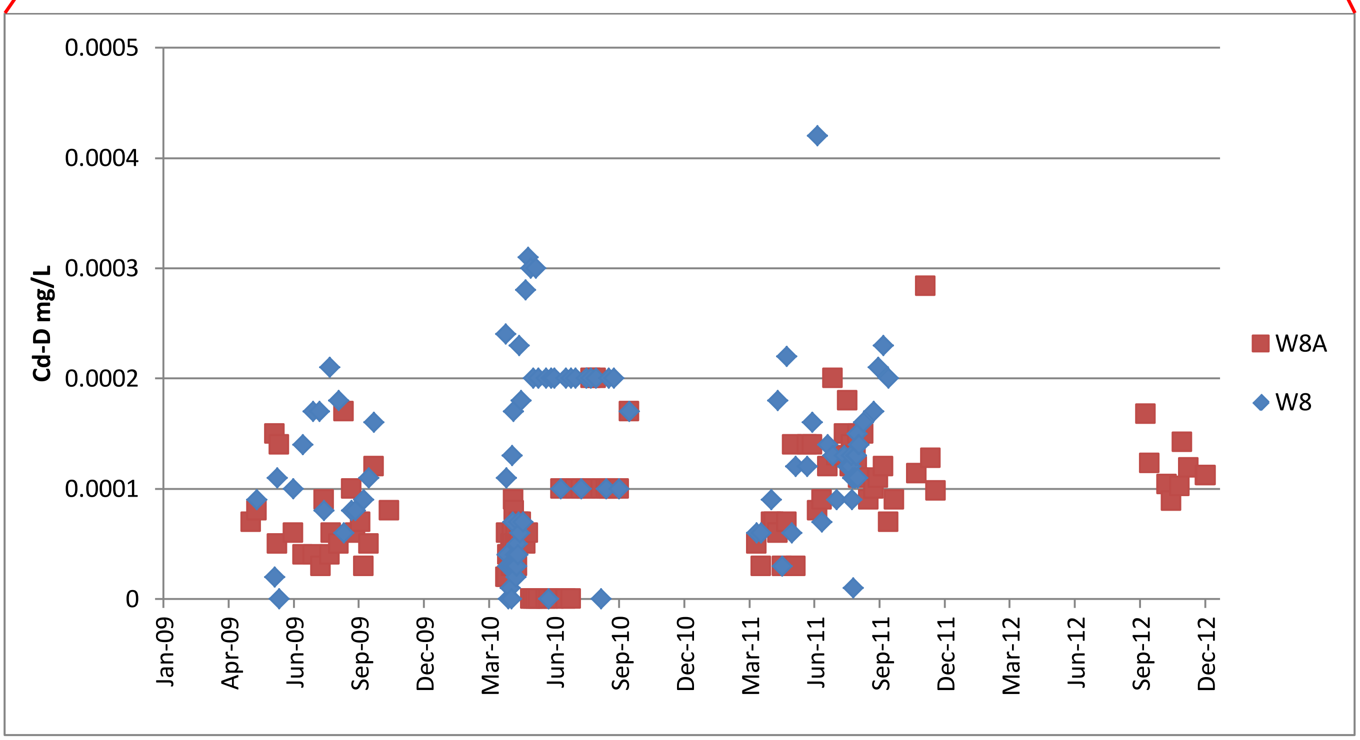

Figure 5-15: Dissolved cadmium concentrations for W8 and W8A, with reduced concentration range, 2009-2012.

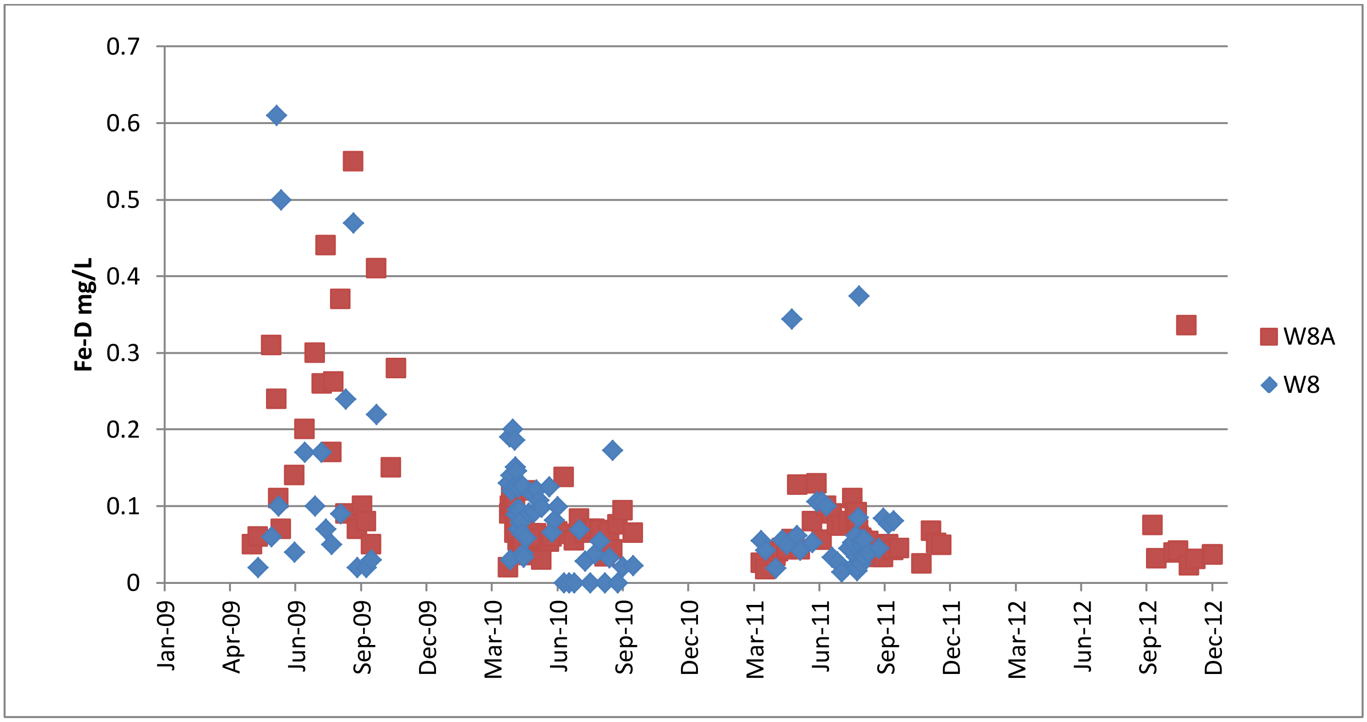

Figure 5-16: Dissolved iron concentrations for W8 and W8A, 2009-2012.

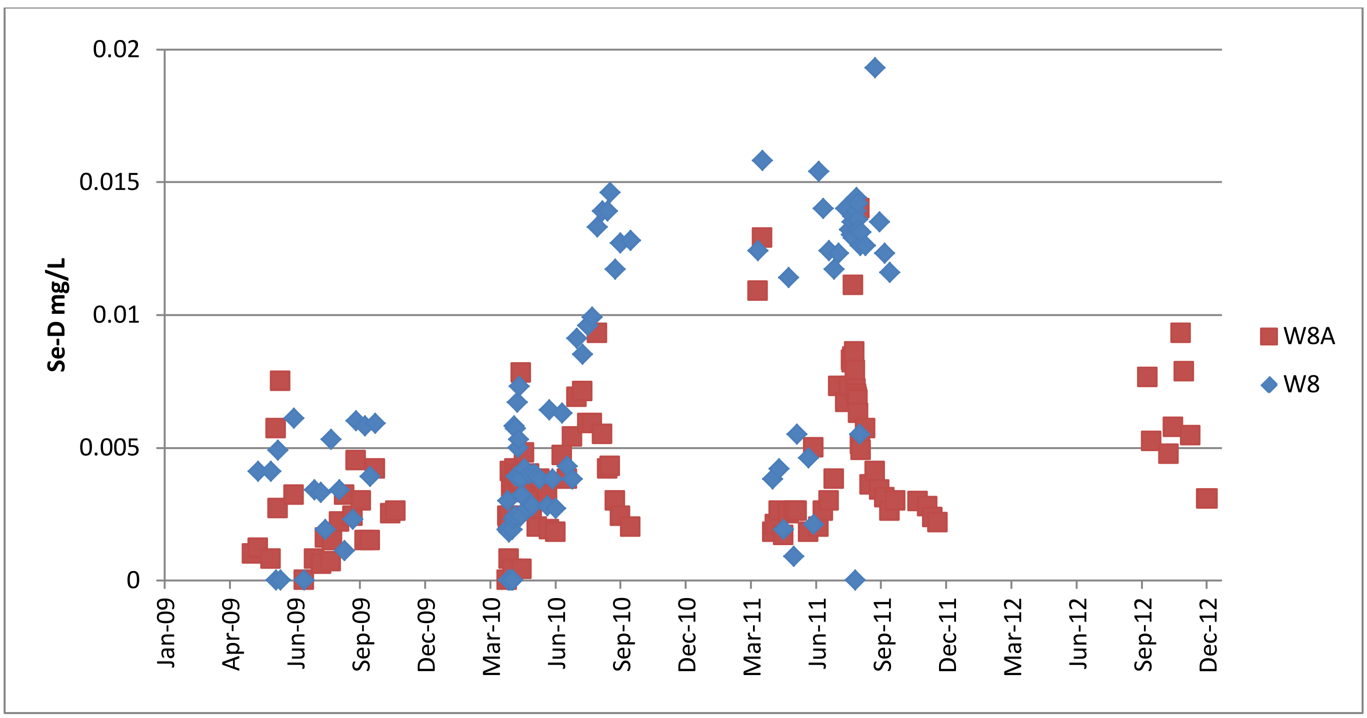

Figure 5-17: Dissolved selenium concentrations for W8 and W8A, 2009-2012.

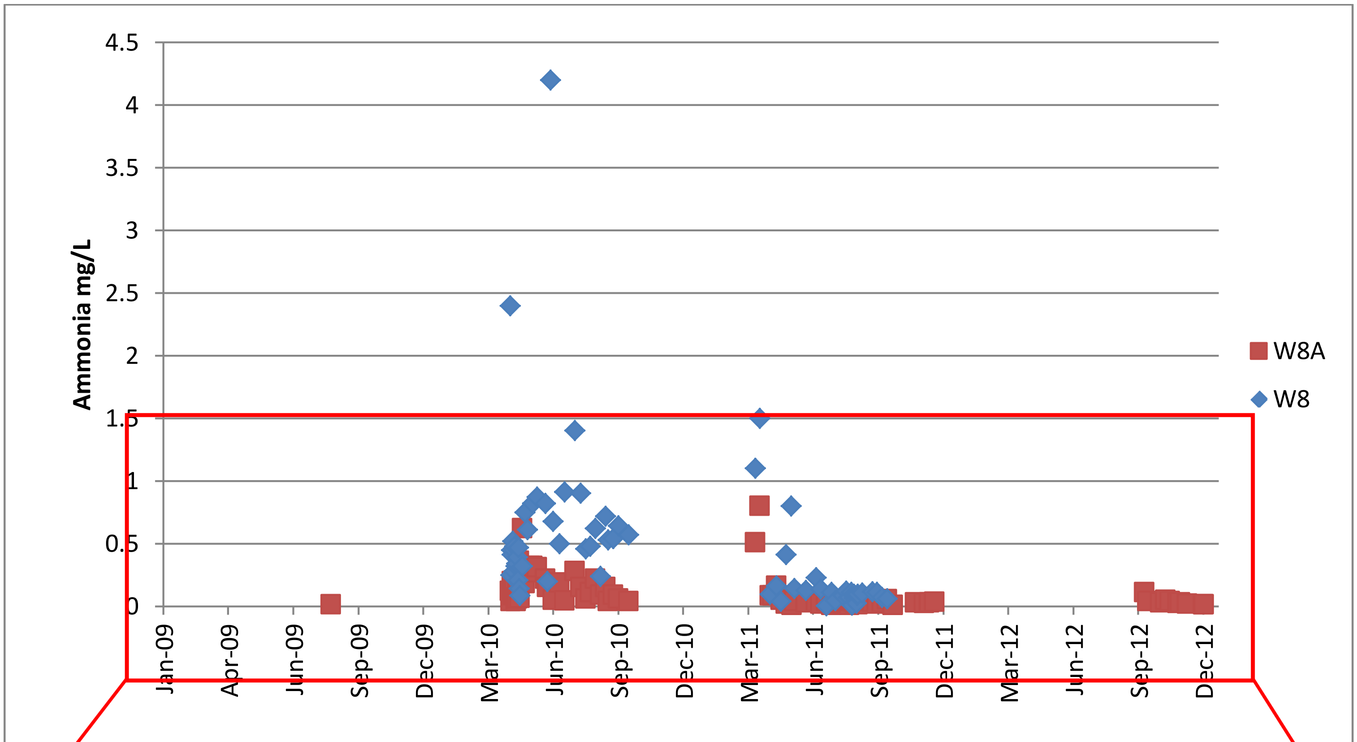

Figure 5-18: Ammonia concentrations for W8 and W8A, 2009-2012.

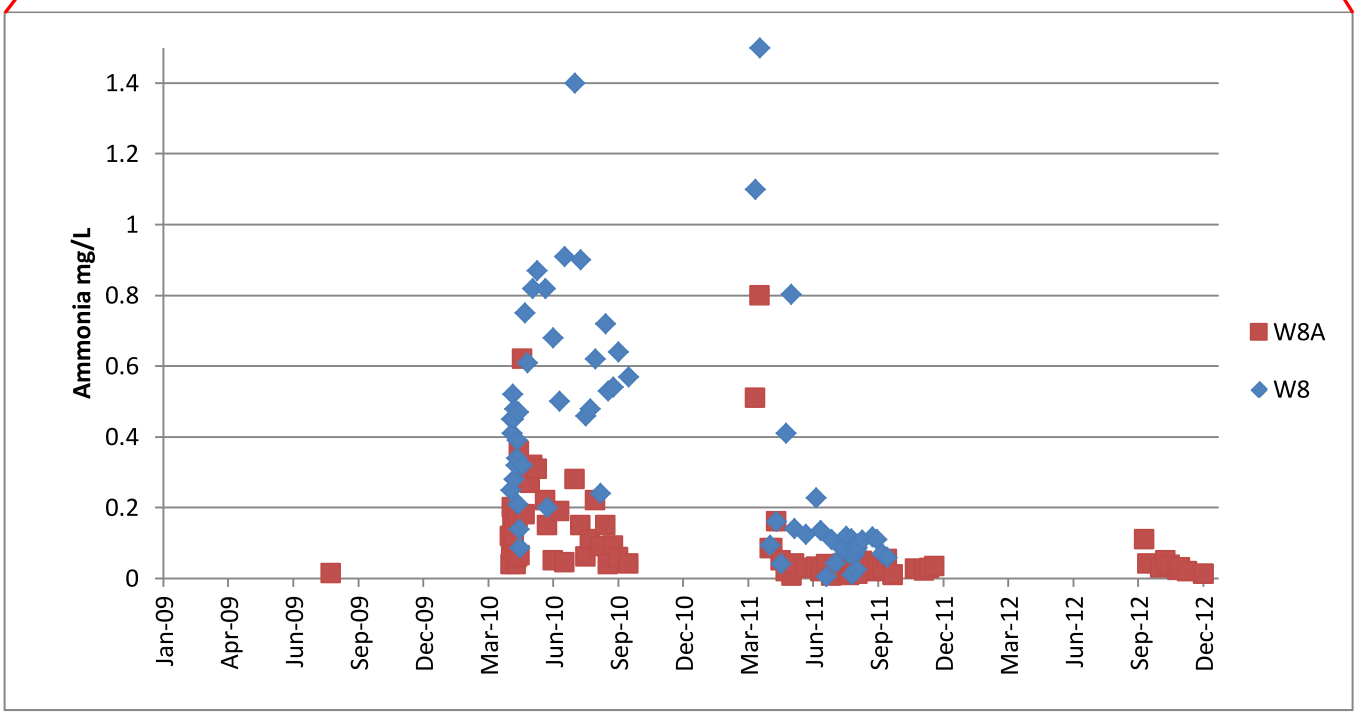

Figure 5-19: Ammonia concentrations for W8 and W8A, with reduced concentration range, 2009-2012.

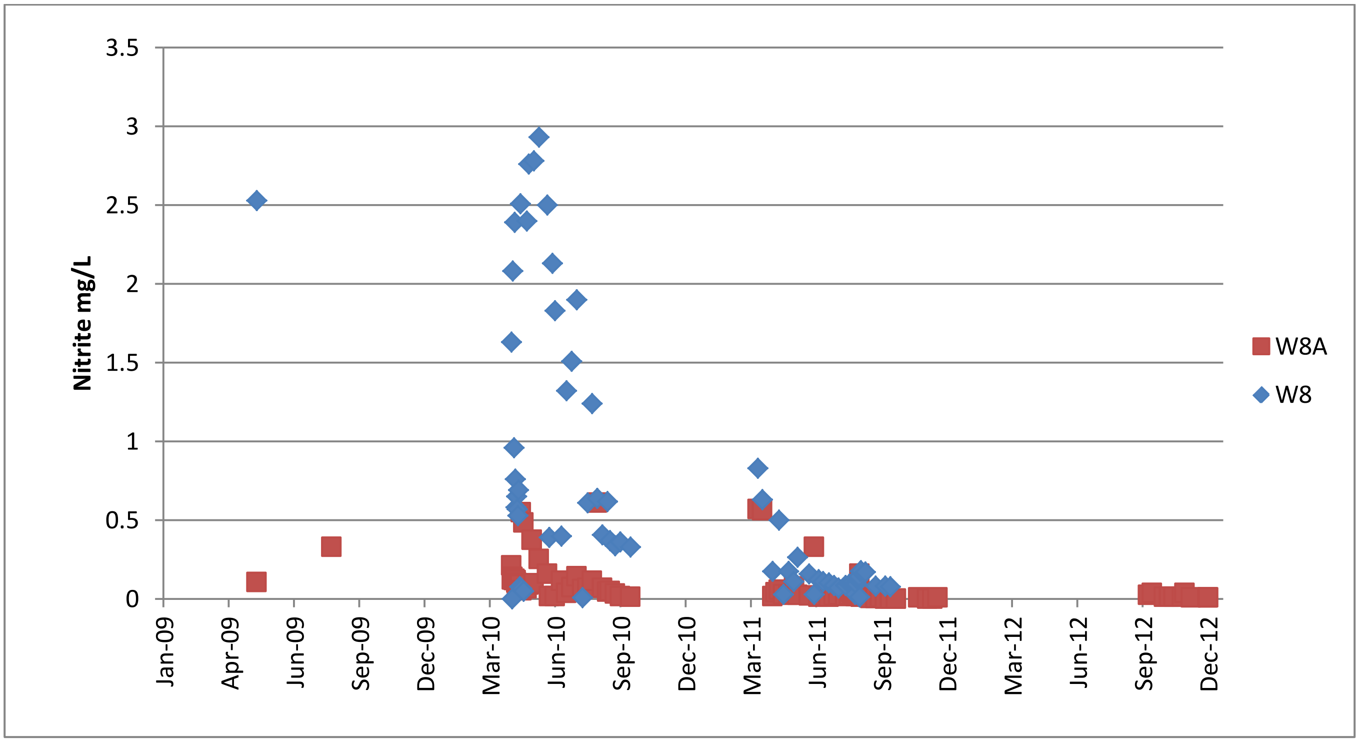

Figure 5-20: Nitrite concentrations for W8 and W8A, 2010-2012.

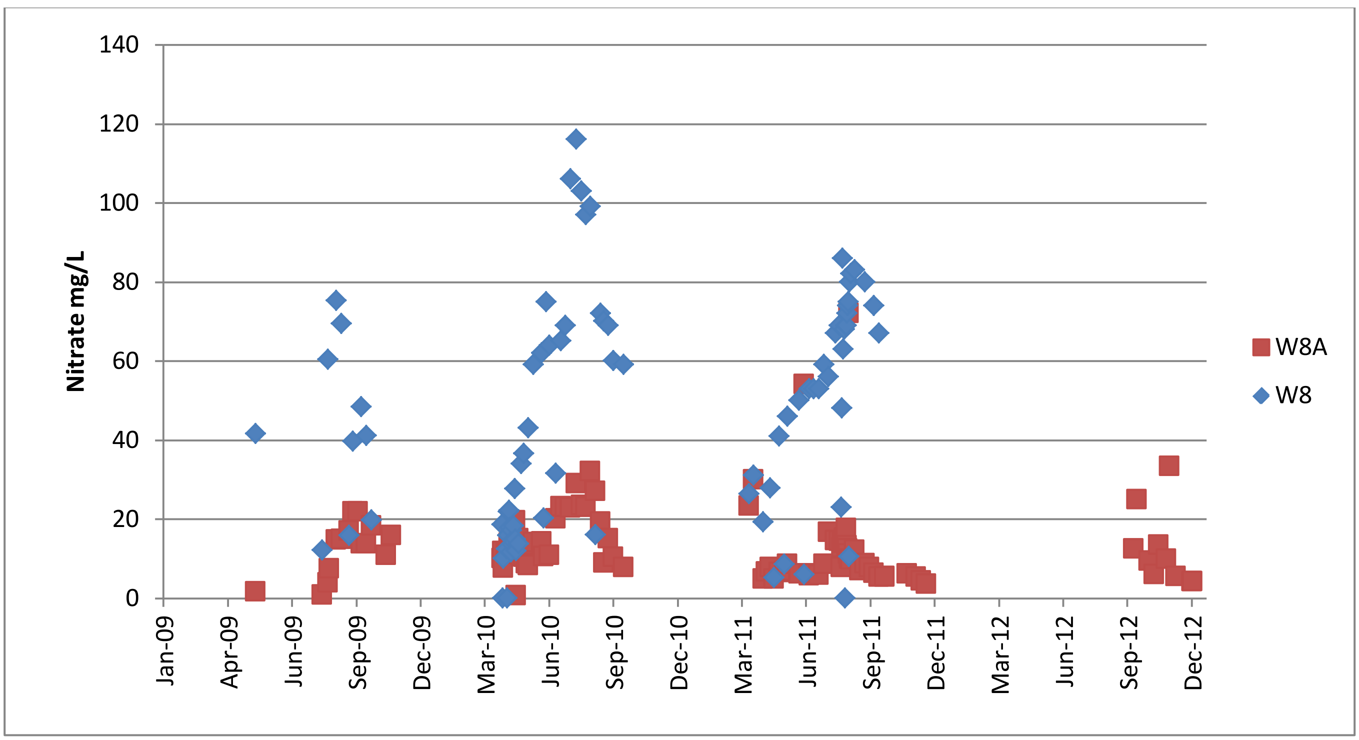

Figure 5-21: Nitrate concentrations for W8 and W8A, 2009-2012.

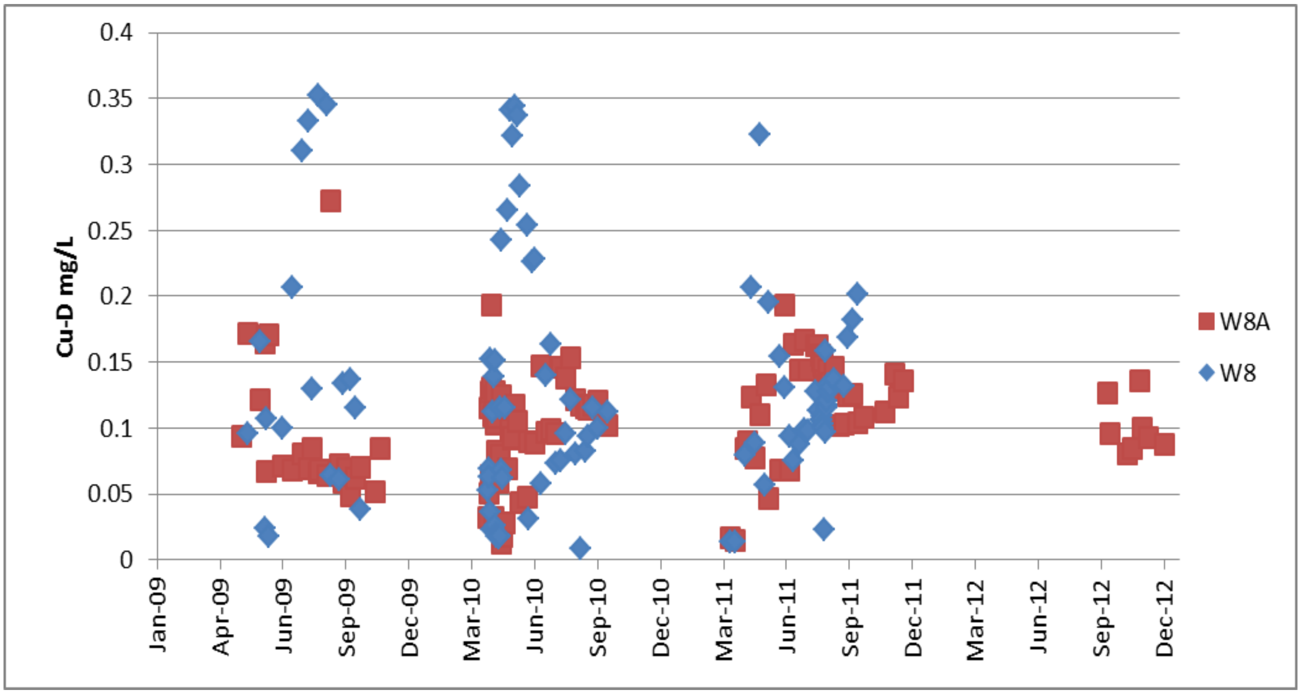

Figure 5-22: Dissolved copper concentrations for W8 and W8A, 2009-2012.

5.4.2 Water Quality Stations along the Southwest Dump

W32- At toe of Southwest (Southwest fork)

W38- Original Ground near Southwest Dump 90 m NW of W15

W39- Original Ground near Southwest Dump 165 m SW of W15

W40- Original Ground near Southwest Dump 290 m SW of W15

All seepage locations along the Southwest Dump were recorded by GPS and samples were taken within ±5 m of the GPS coordinate.

The 2009 to 2012 water quality results for W32, W38, W39 and W40 are displayed in Figures 5-23 to 5-32. Water quality parameters displayed includes: dissolved cadmium (Figure 5-23 and Figure 5-24), dissolved iron (Figure 5-25 and Figure 5-26), dissolved selenium (Figure 5-27), ammonia (Figure 5-28), nitrite (Figure 5-29 and Figure 5-30), nitrate (Figure 5-31) and dissolved copper (Figure 5-32).

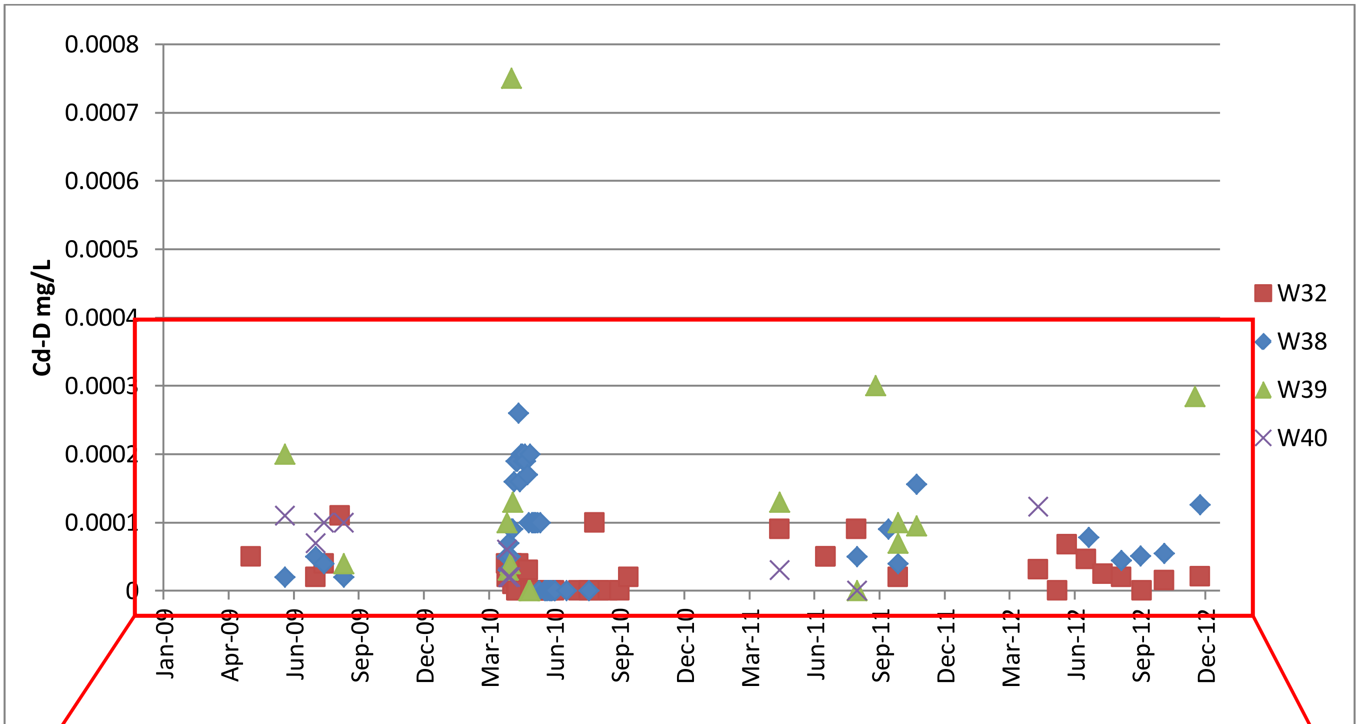

Figure 5-23: Dissolved cadmium concentrations at W32, W38, W39 and W40, 2009-2012.

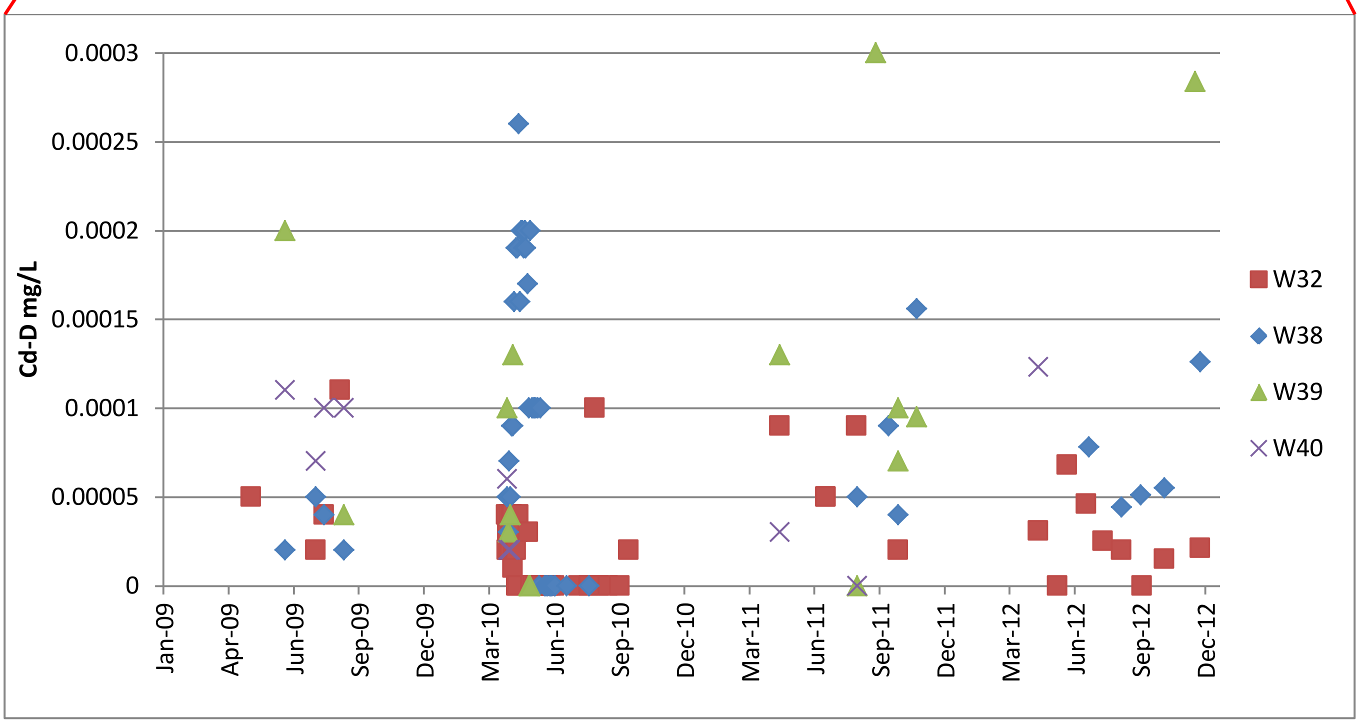

Figure 5-24: Dissolved cadmium concentrations at W32, W38, W39 and W40, with reduced concentration range, 2009-2012.

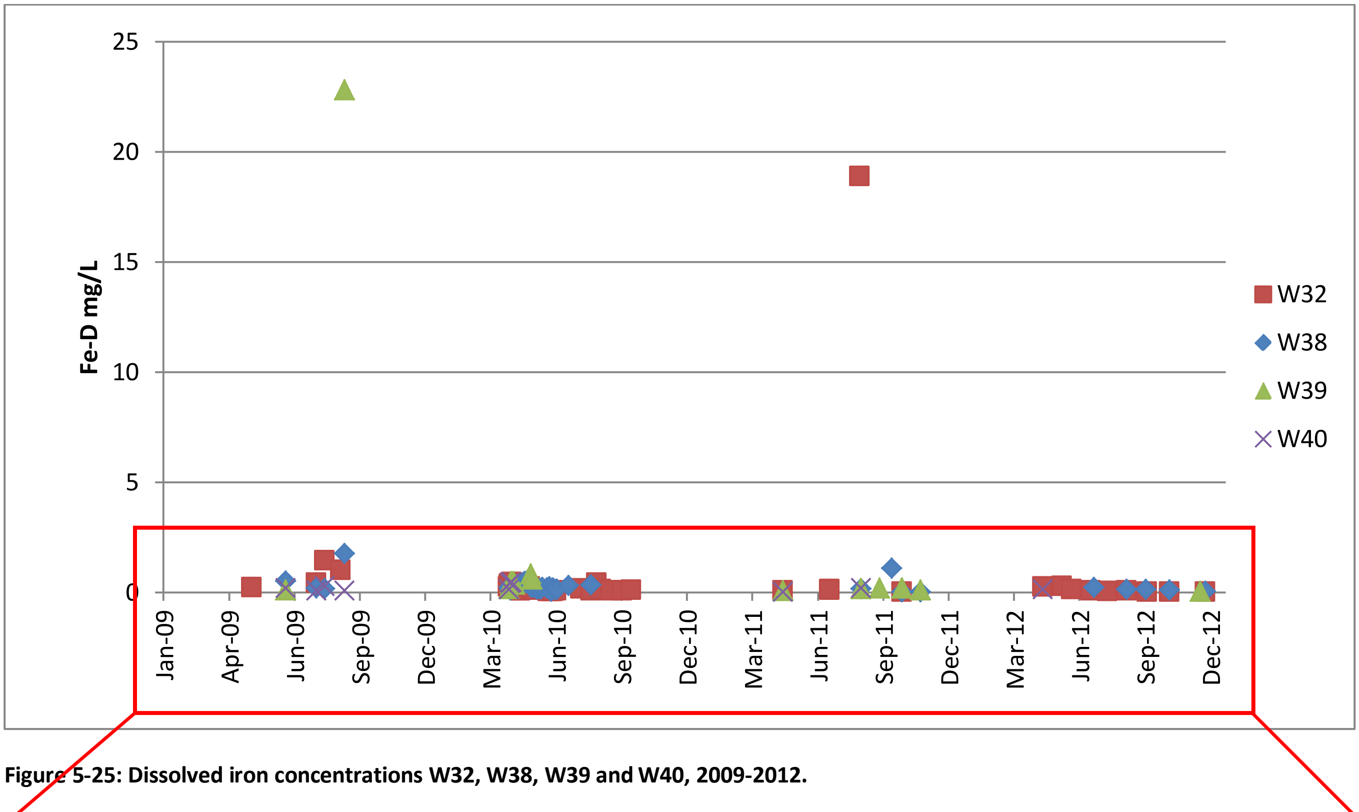

Figure 5-25: Dissolved iron concentrations W32, W38, W39 and W40, 2009-2012.

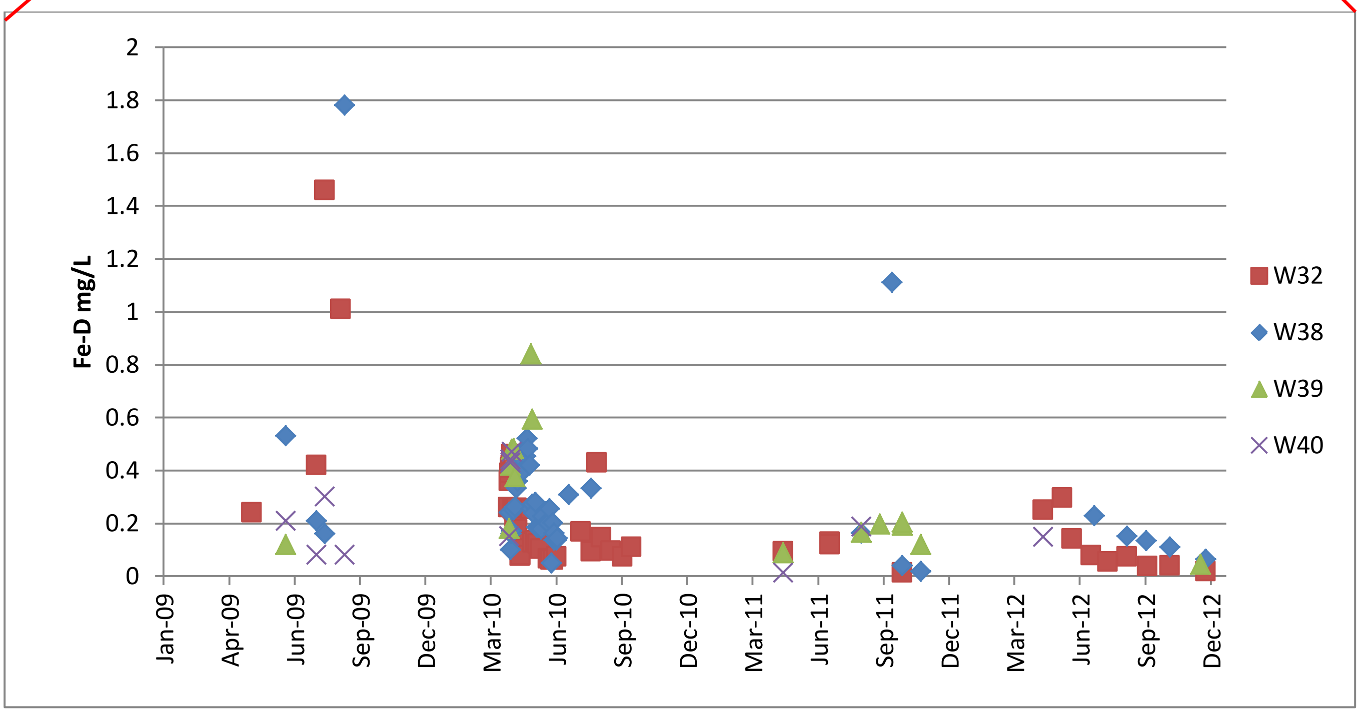

Figure 5-26: Dissolved iron concentrations, at W32, W38, W39 and W40, with reduced concentration range, 2009-2012.

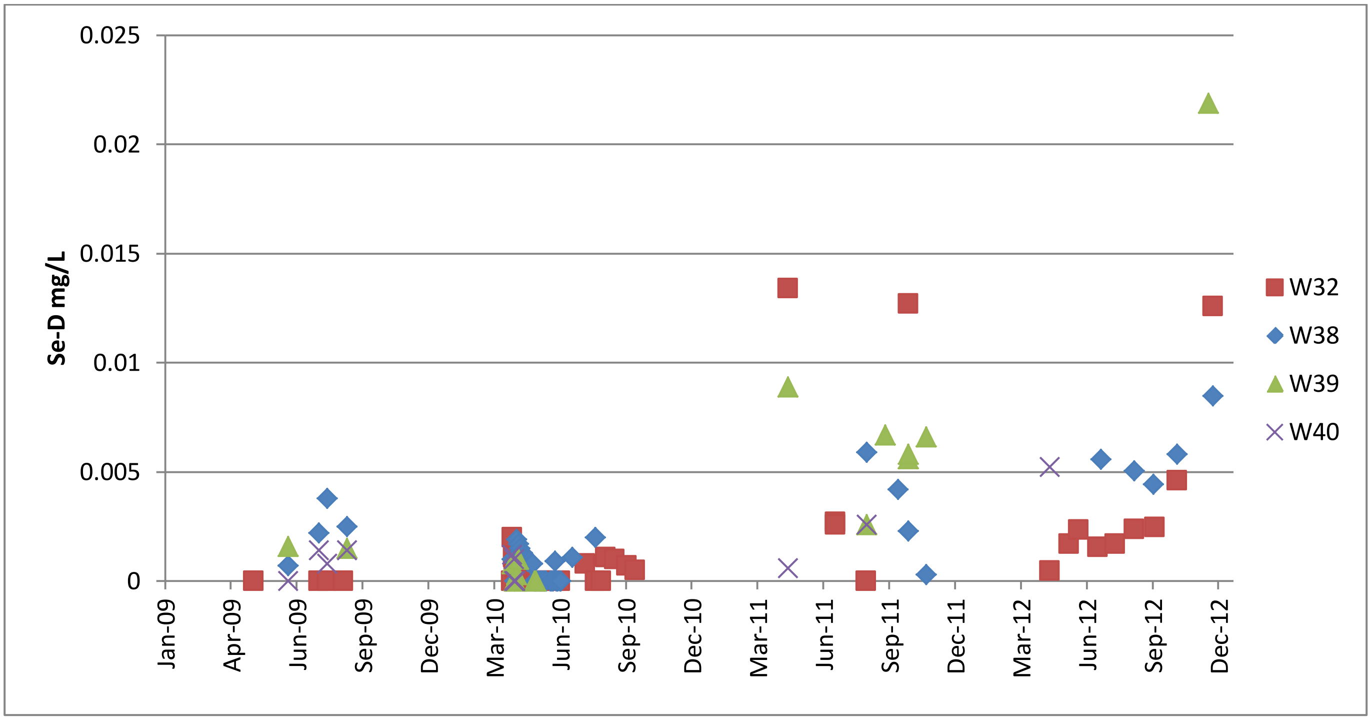

Figure 5-27: Dissolved selenium concentrations at W32, W38, W39 and W40, 2009-2012.

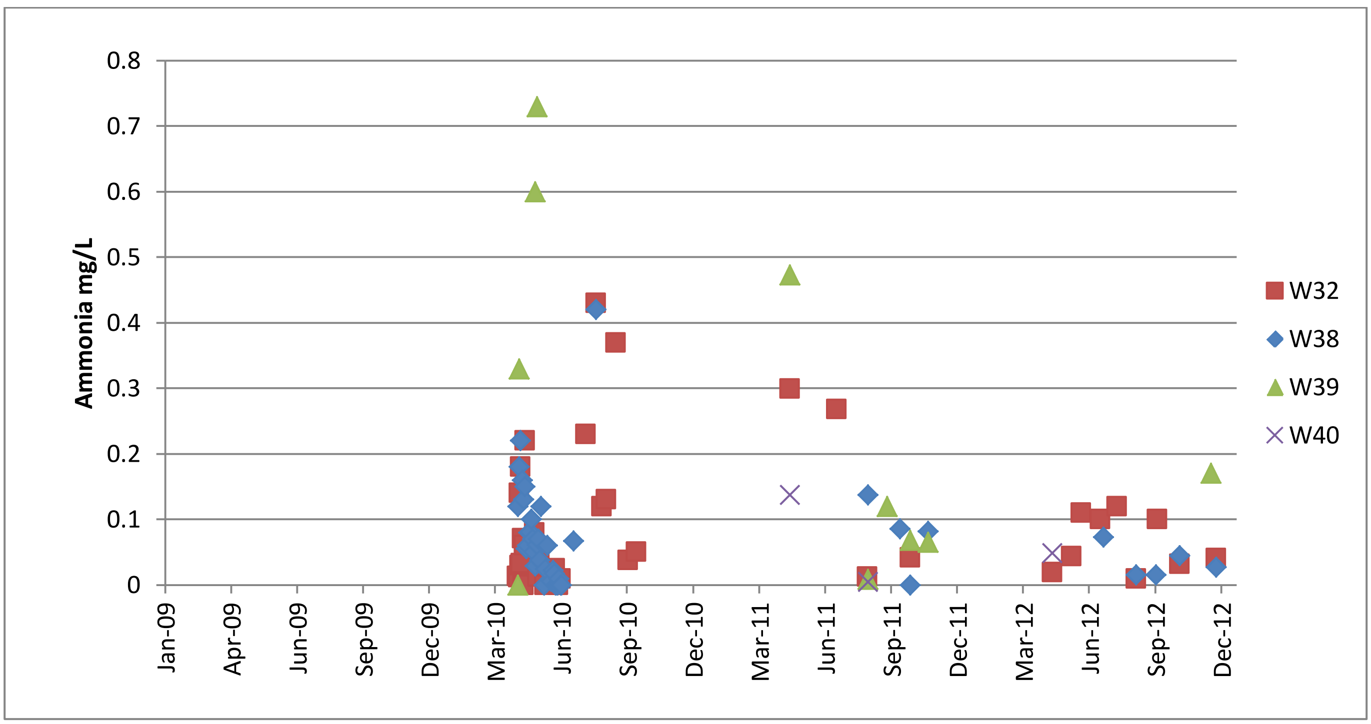

Figure 5-28: Ammonia concentrations at W32, W38, W39 and W40, 2010-2012.

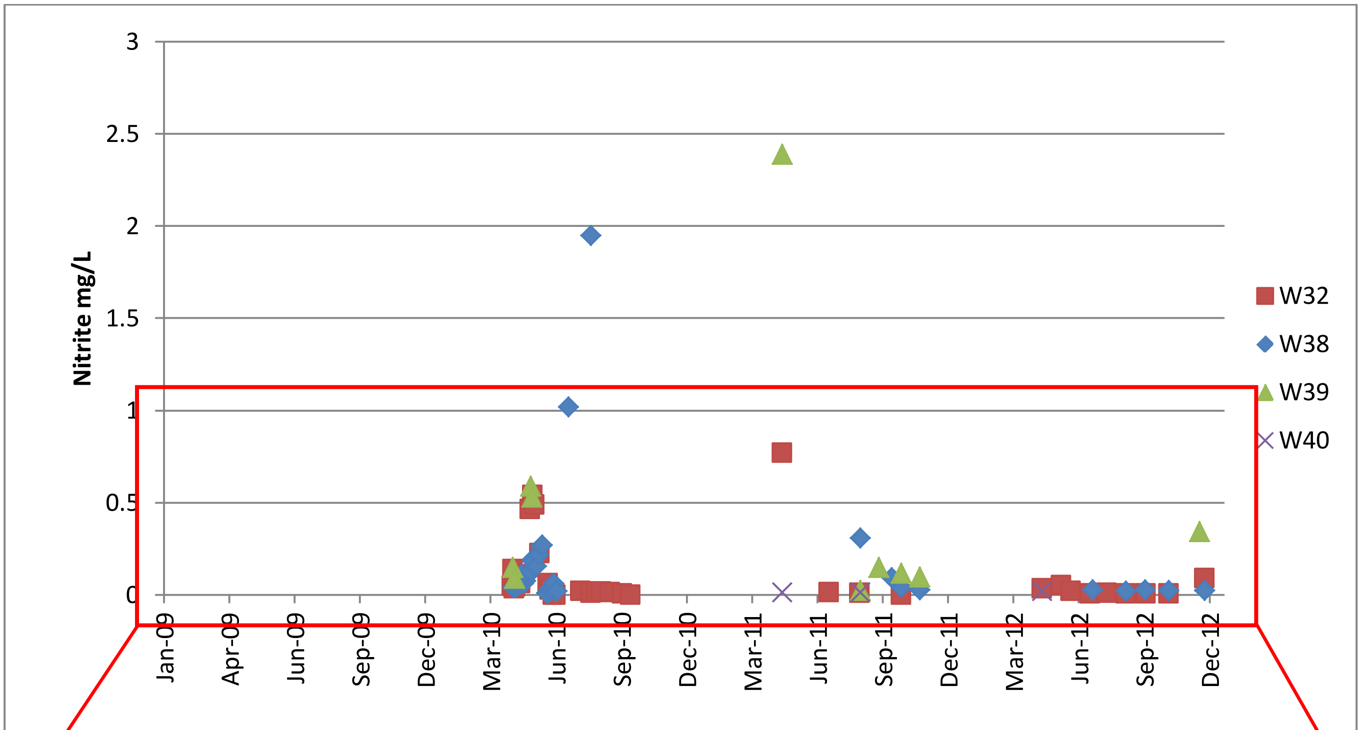

Figure 5-29: Nitrite concentrations at W32, W38, W39 and W40, 2010-2012.

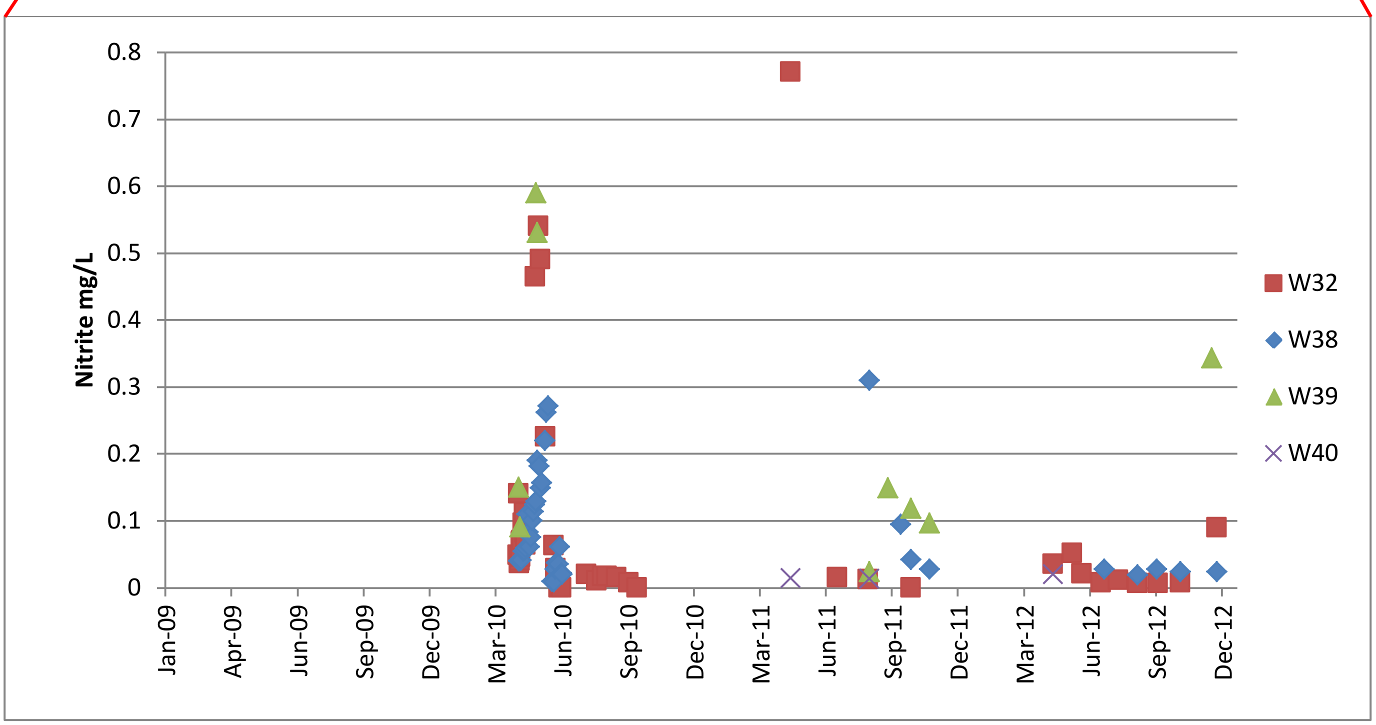

Figure 5-30: Nitrite concentrations at W32, W38, W39 and W40, with reduced concentration range, 2010-2012.

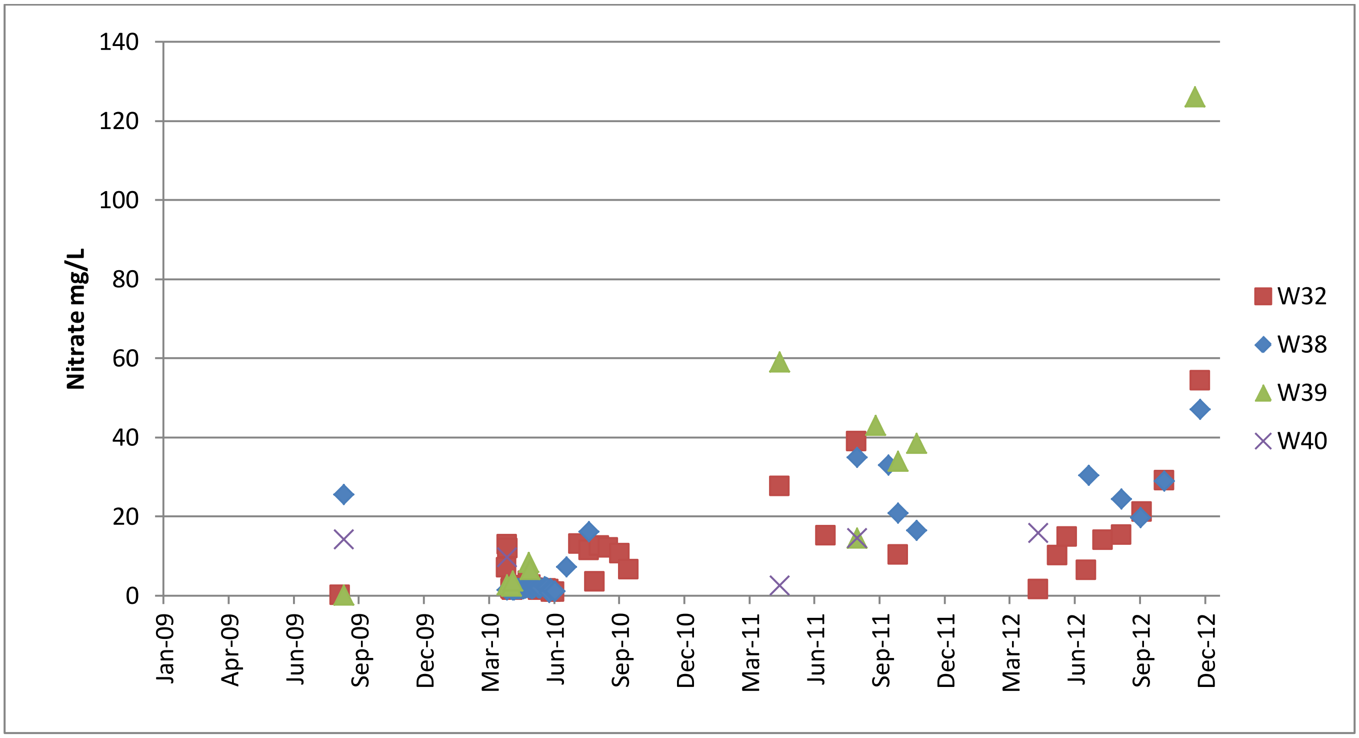

Figure 5-31: Nitrate concentrations at W32, W38, W39 and W40, 2010-2012.

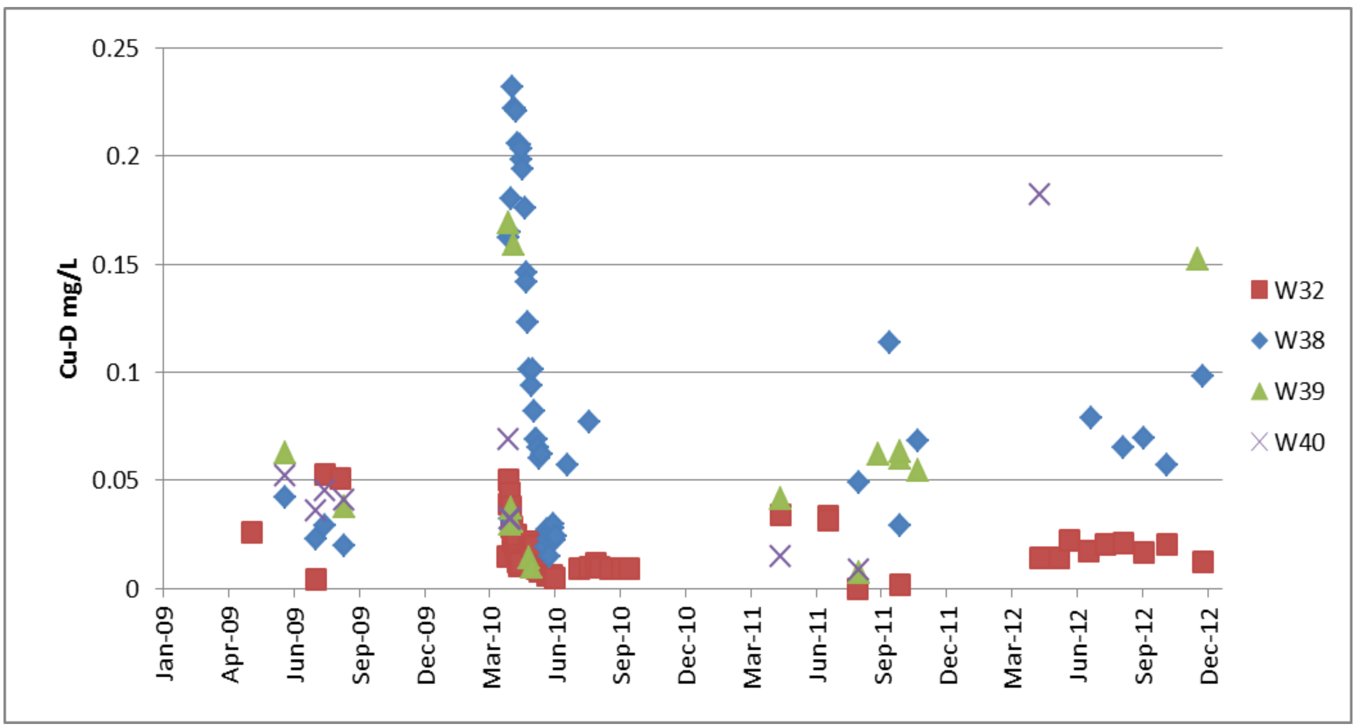

Figure 5-32: Dissolved copper concentrations at W32, W38, W39 and W40, 2009-2012.

5.4.3 W37 – 100m Downstream of Minto Creek Detention Structure (W37 Collection Sump) and Upstream of the Water Storage Pond

Seepage water quality station W37 is fed by the Minto Creek Detention Structure (MCDS) which collects water coming off the DSTSF, MVFE and overflow water from the Mill Pond. Previous to WUL Amendment 8, W37 samples were taken from within the MCDS and not seepage from the MCDS. Therefore historical data for this W37 has not been included in Figures 5-33 to 5-36. As of November 1, 2012 W37 was sampled as MCDS seepage and sampling will continue in this manner..

2012 W37 water quality results are displayed in Figures 5-33 to 5-36. Water quality parameters displayed includes: dissolved cadmium, dissolved copper, dissolved iron (Figure 5-33); ammonia, nitrite (Figure 5-34); nitrate (Figure 5-35) and dissolved selenium (Figure 5-36).

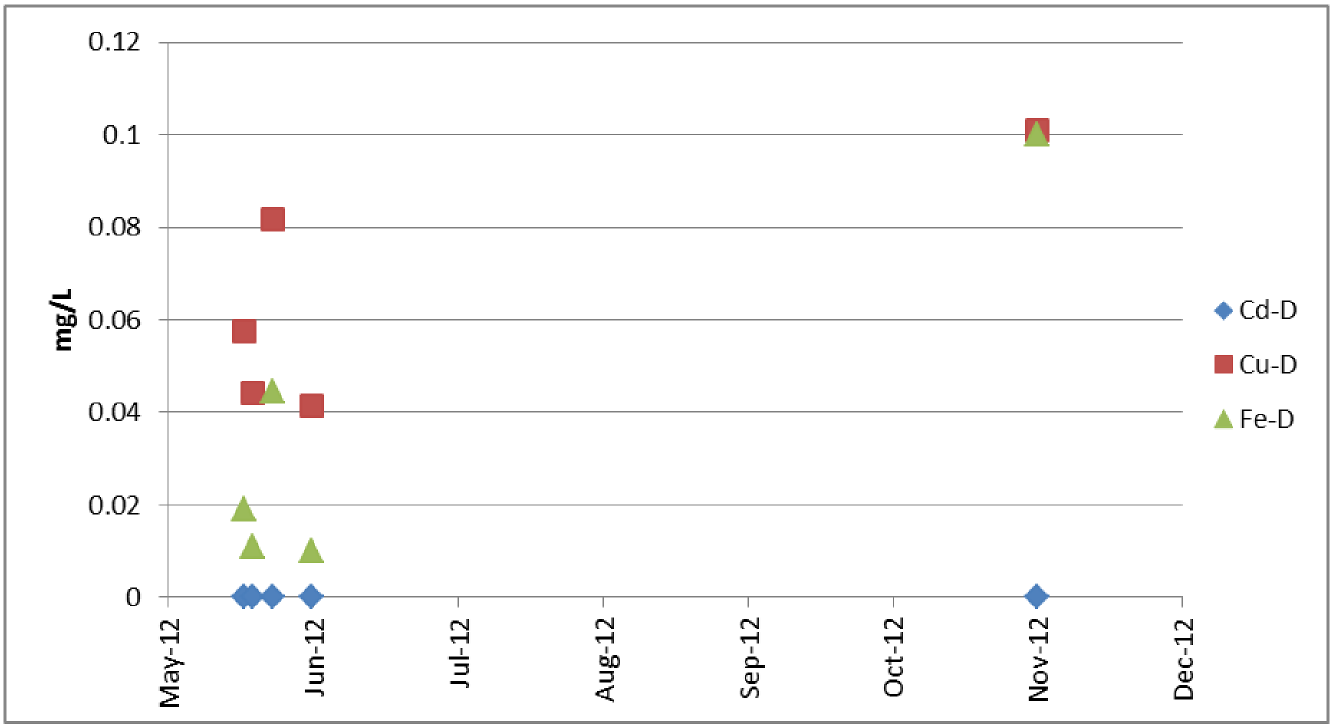

Figure 5-33: Dissolved cadmium, dissolved copper, and dissolved iron concentrations at W37 for 2012.

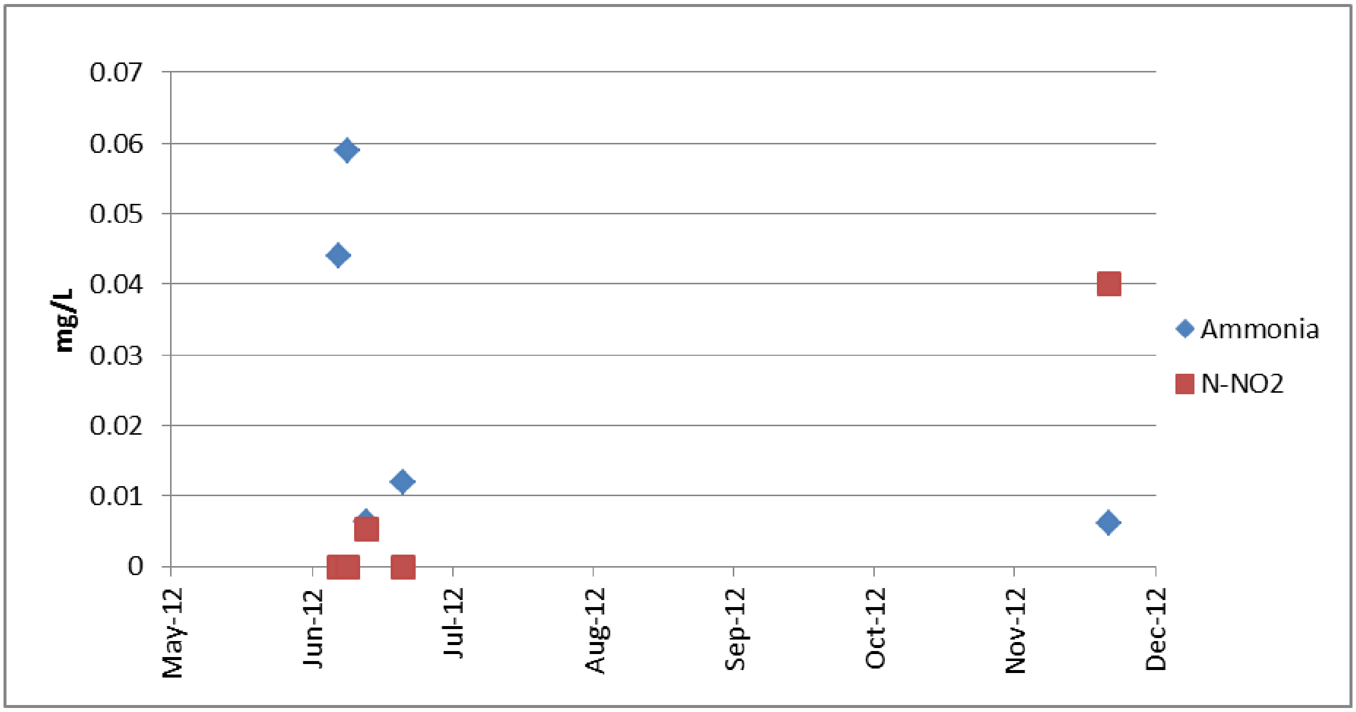

Figure 5-34: Ammonia and nitrite concentrations at W37 for 2012.

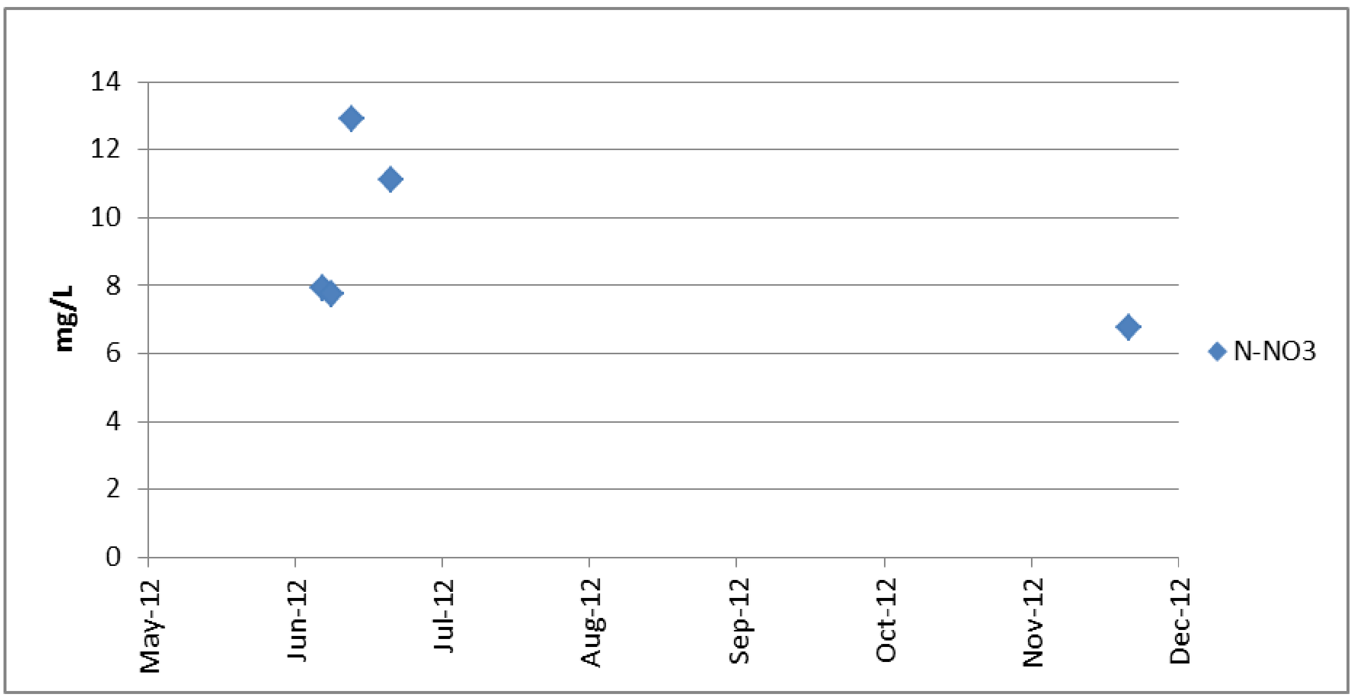

Figure 5-35: Nitrate concentrations at W37 for 2012.

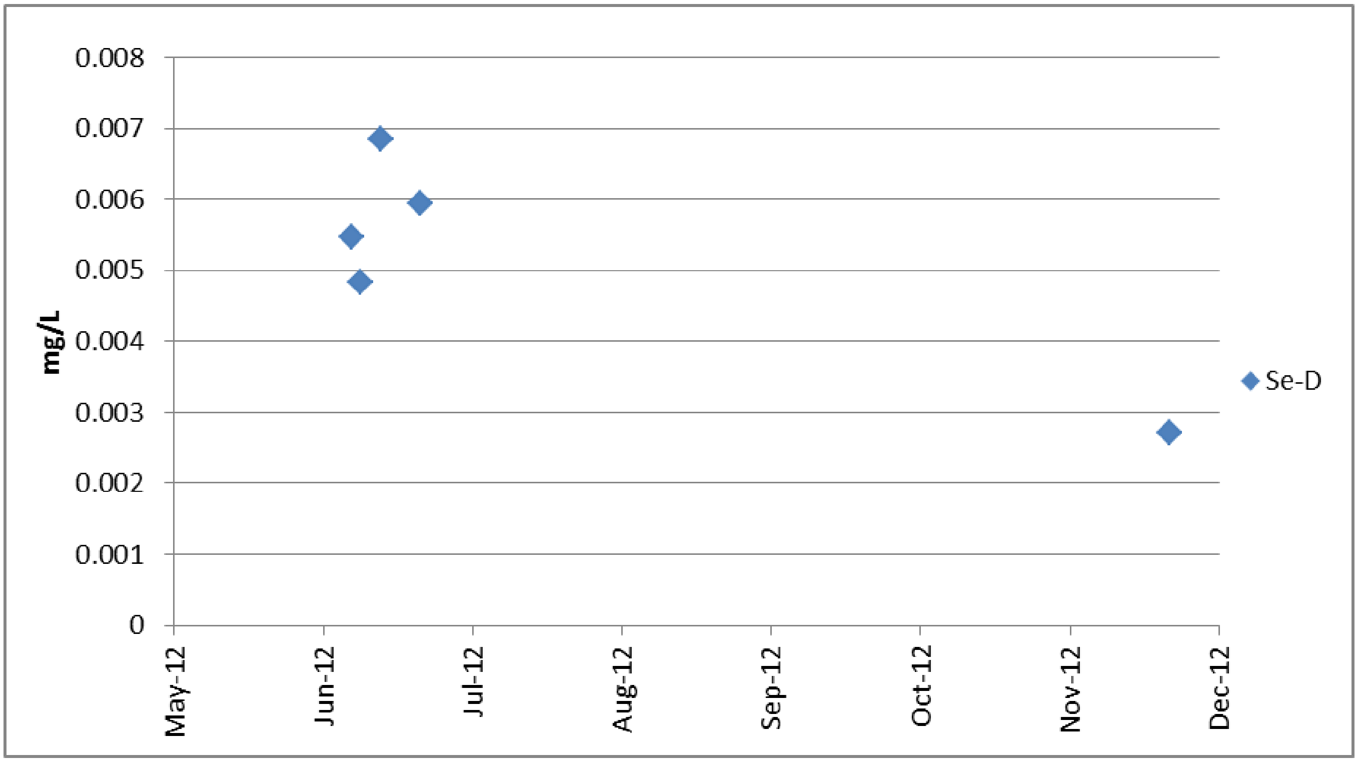

Figure 5-36: Dissolved selenium concentrations at W37 for 2012.

5.4.4 W17 – Water Storage Pond Dam Seepage

Water quality at W17 is relatively stable as it is fed by a large stable body of water (Water Storage Pond). All dam seepage is graded and collected in a vertical culvert (W17) and pumped back to the Water Storage Pond.

The 2007 to 2012 W17 water quality results are displayed in Figures 5-37 to 5-47. Water quality parameters displayed includes: dissolved cadmium (Figure 5-37 and Figure 5-38), dissolved iron (Figure 5-39 and Figure 5-40), ammonia (Figure 5-41 and Figure 5-42), nitrite (Figure 5-43 and Figure 5-44)), nitrate (Figure 5-45), dissolved selenium (Figure 5-46) and dissolved copper (Figure 5-47).

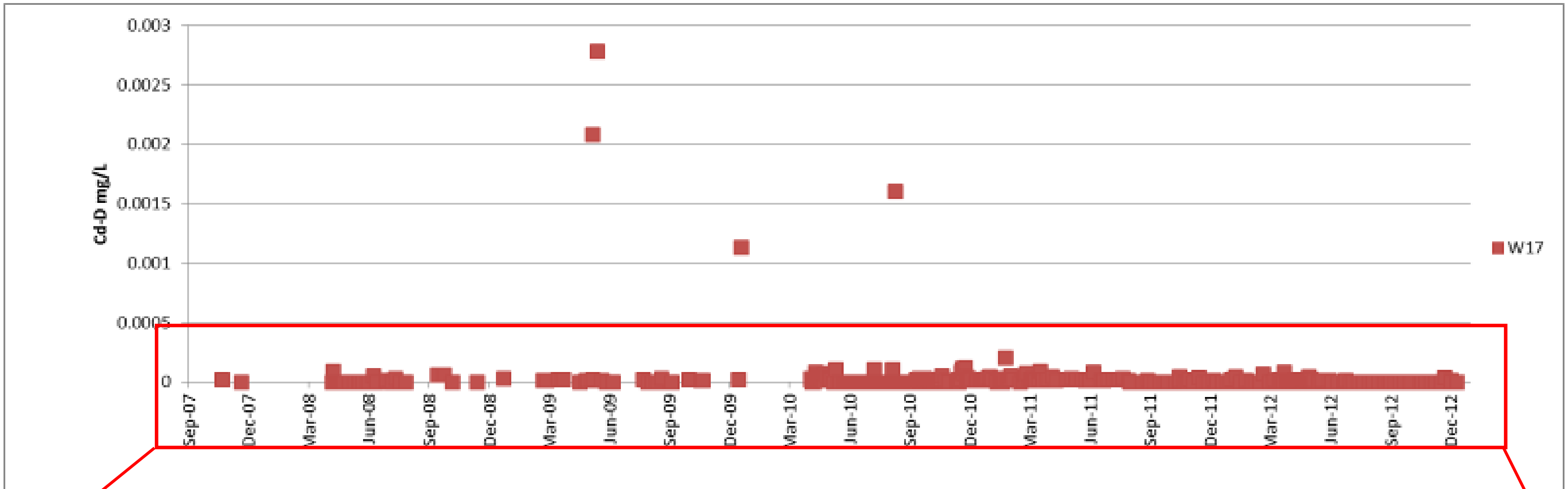

Figure 5-37: Dissolved cadmium concentrations at W17, 2007-2012.

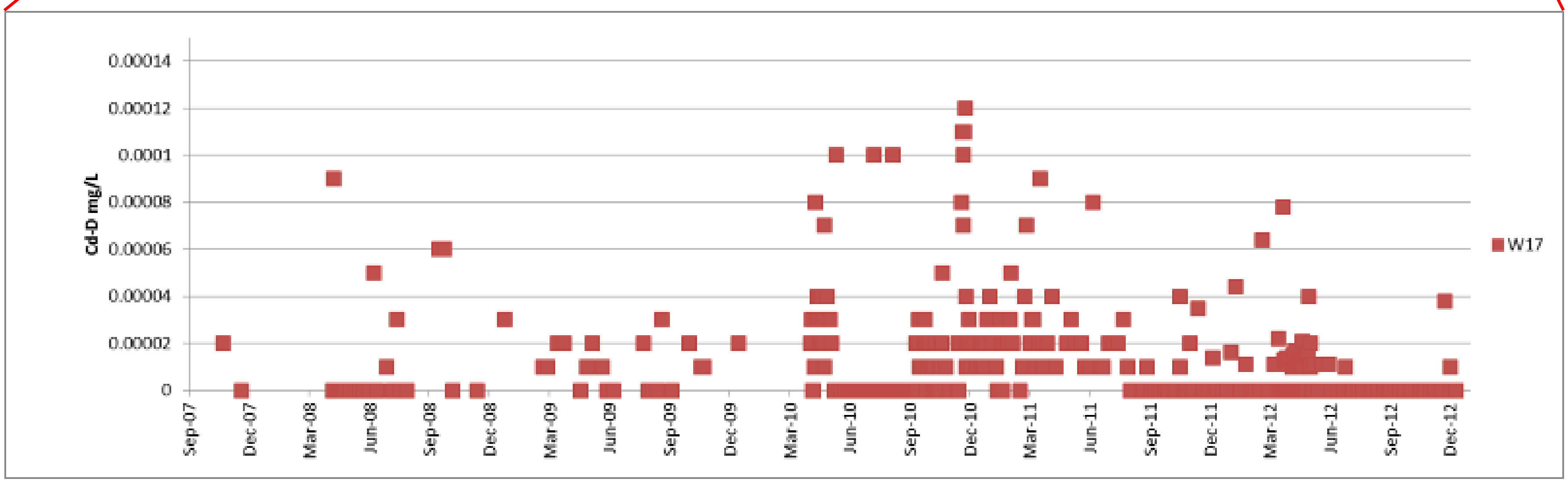

Figure 5-38: Dissolved cadmium concentrations at W17, with reduced concentration range, 2007-2012.

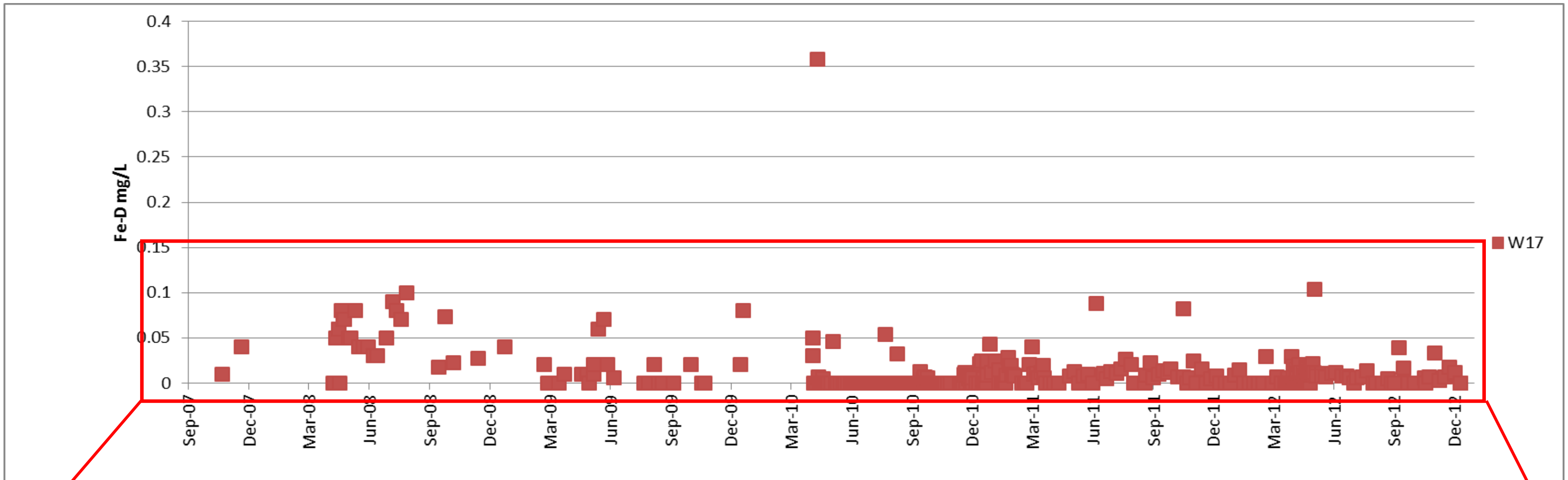

Figure 5-39: Dissolved iron concentrations at W17, 2007-2012.

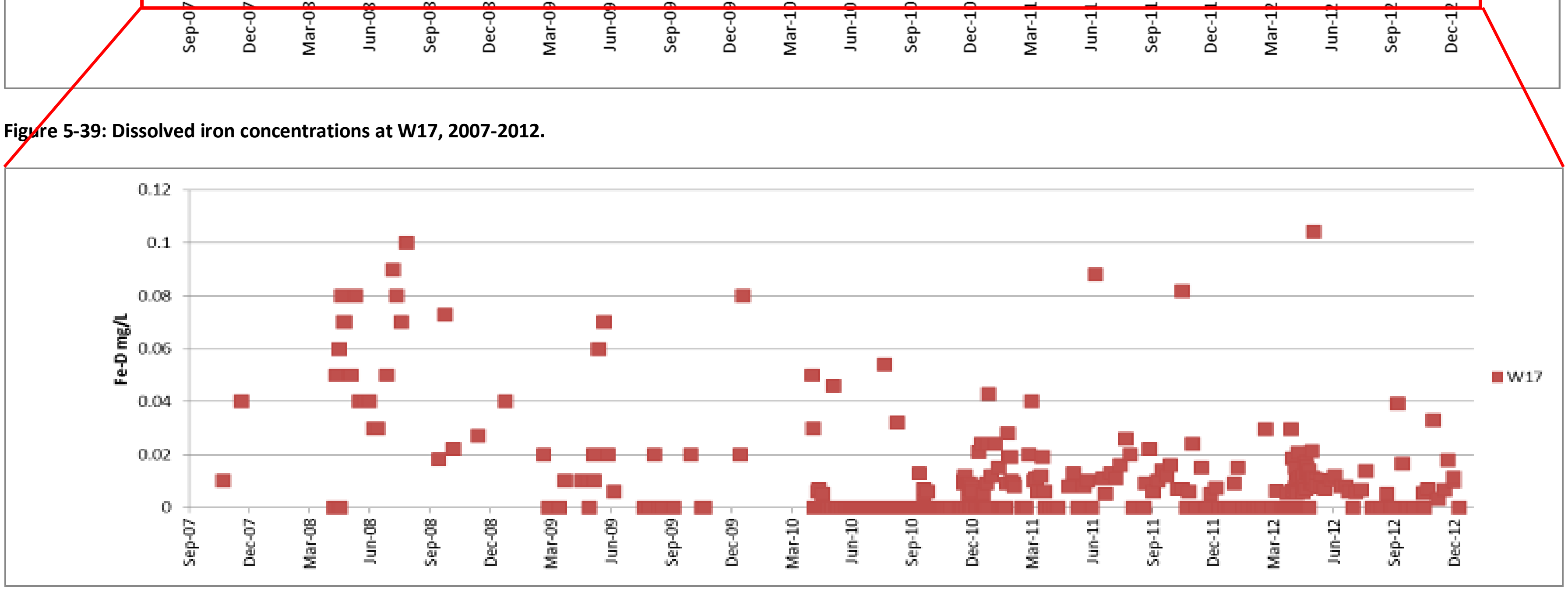

Figure 5-40: Dissolved iron concentrations at W17, with reduced concentration range, 2007-2012.

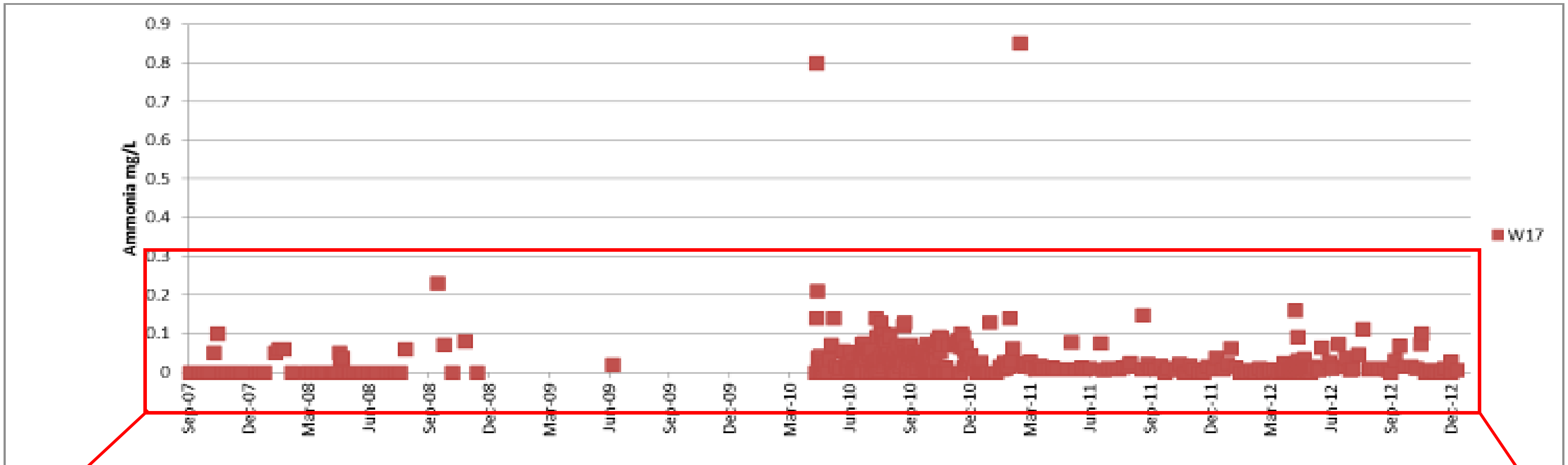

Figure 5-41: Ammonia concentrations at W17, 2007-2012.

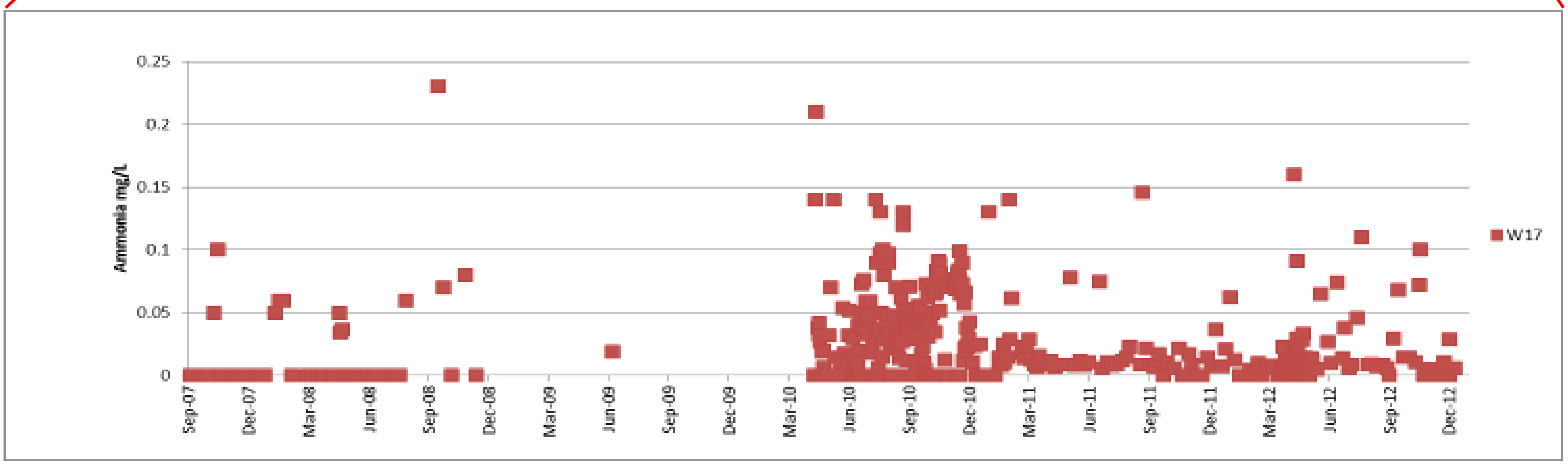

Figure 5-42: Ammonia concentrations at W17, with reduced concentration range, 2007-2012.

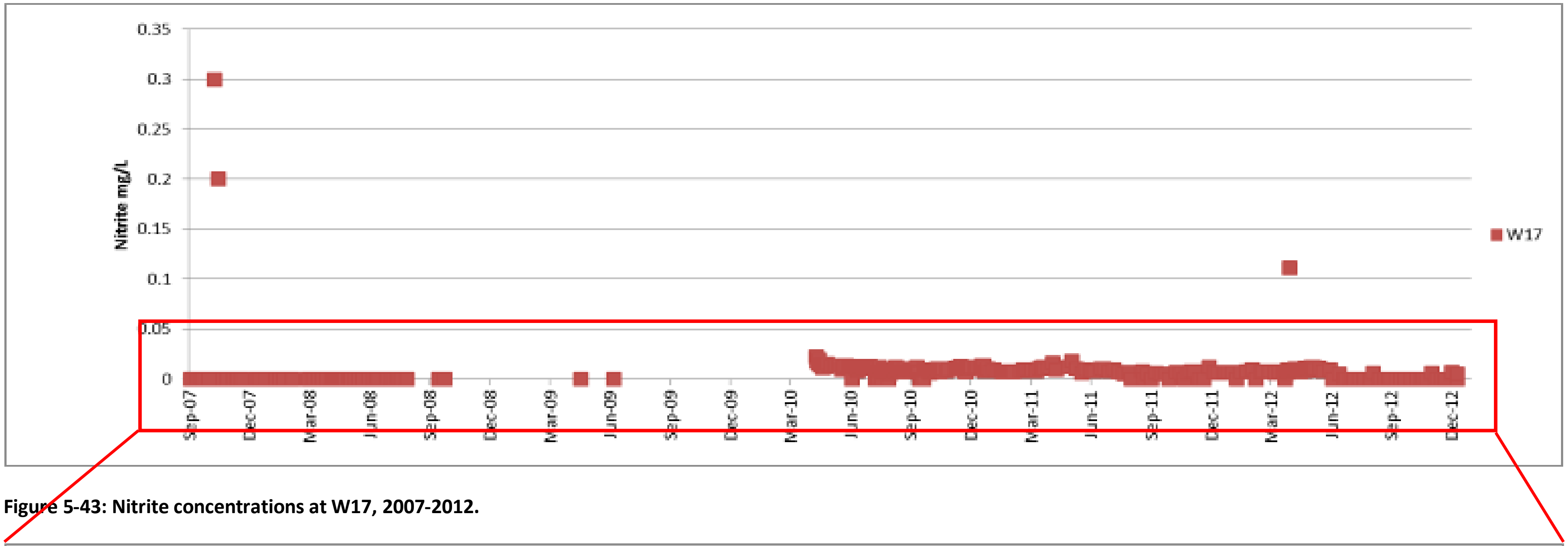

Figure 5-43: Nitrite concentrations at W17, 2007-2012.

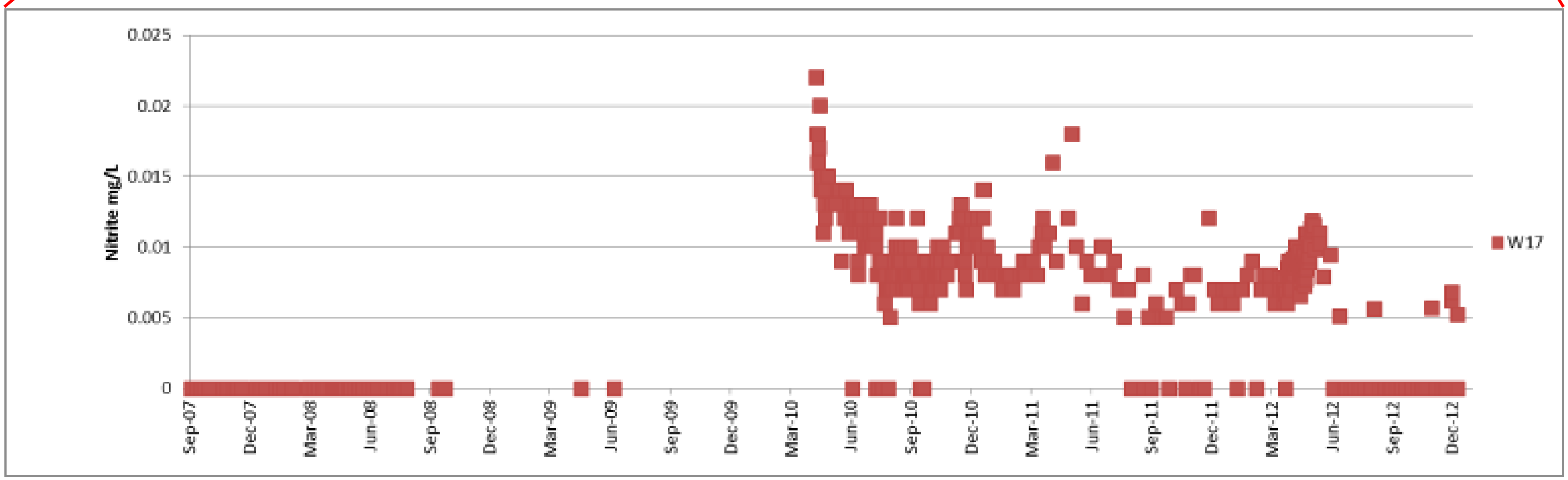

Figure 5-44: Nitrite concentrations at W17, with reduced concentration range, 2007-2012.

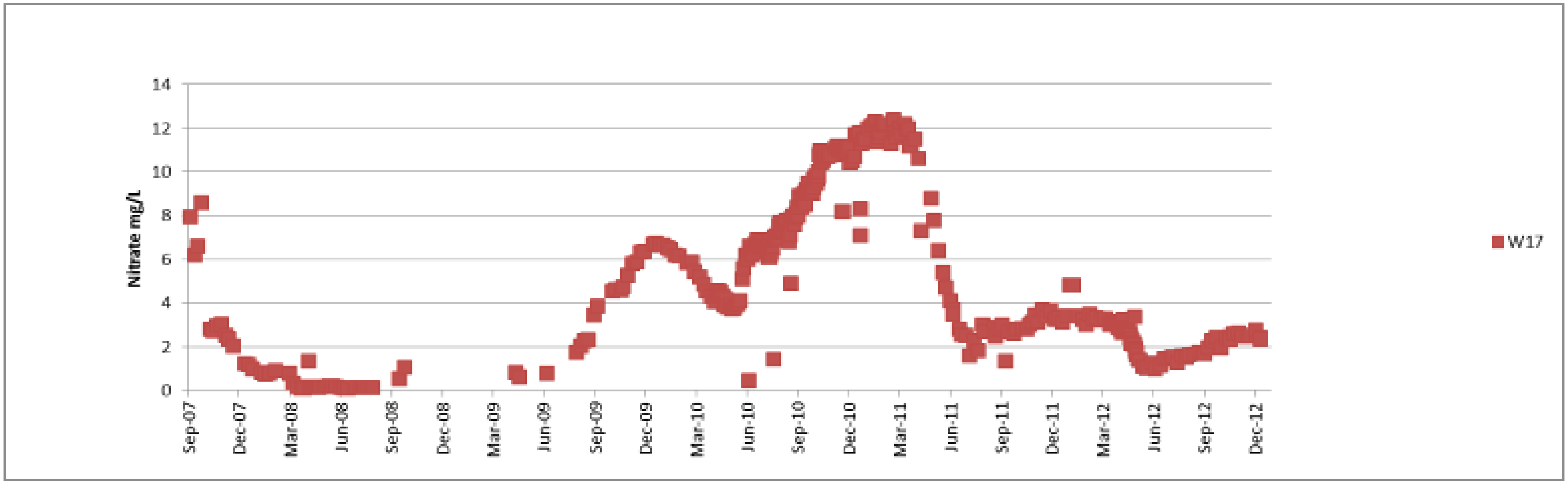

Figure 5-45: Nitrate concentrations at W17, 2007-2012.

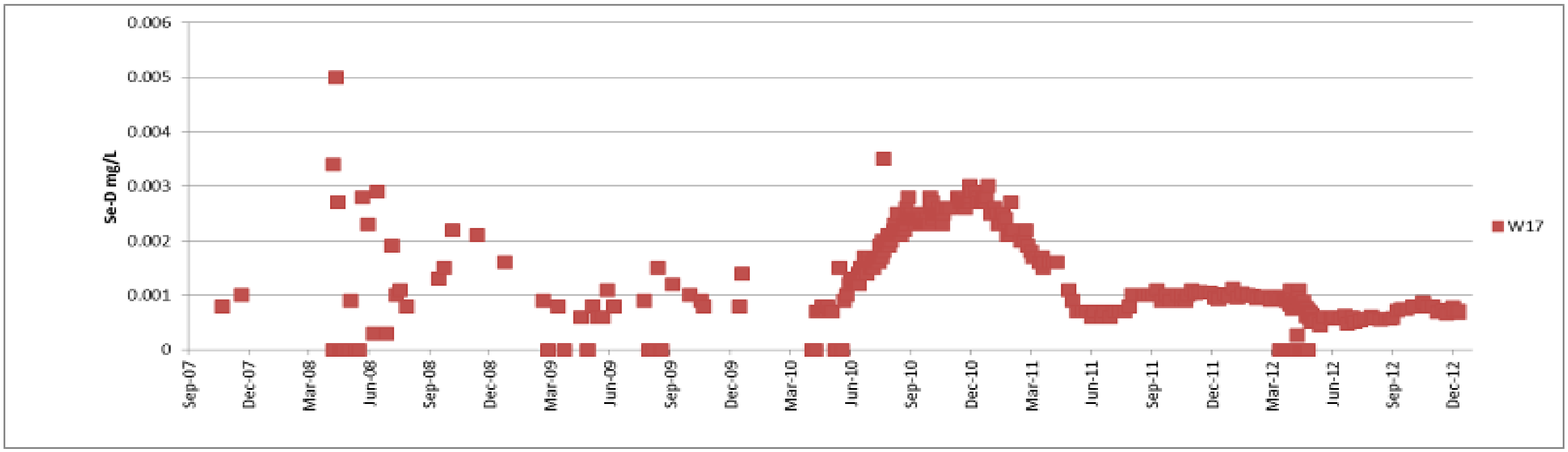

Figure 5-46: Dissolved selenium concentrations at W17, 2007-2012.

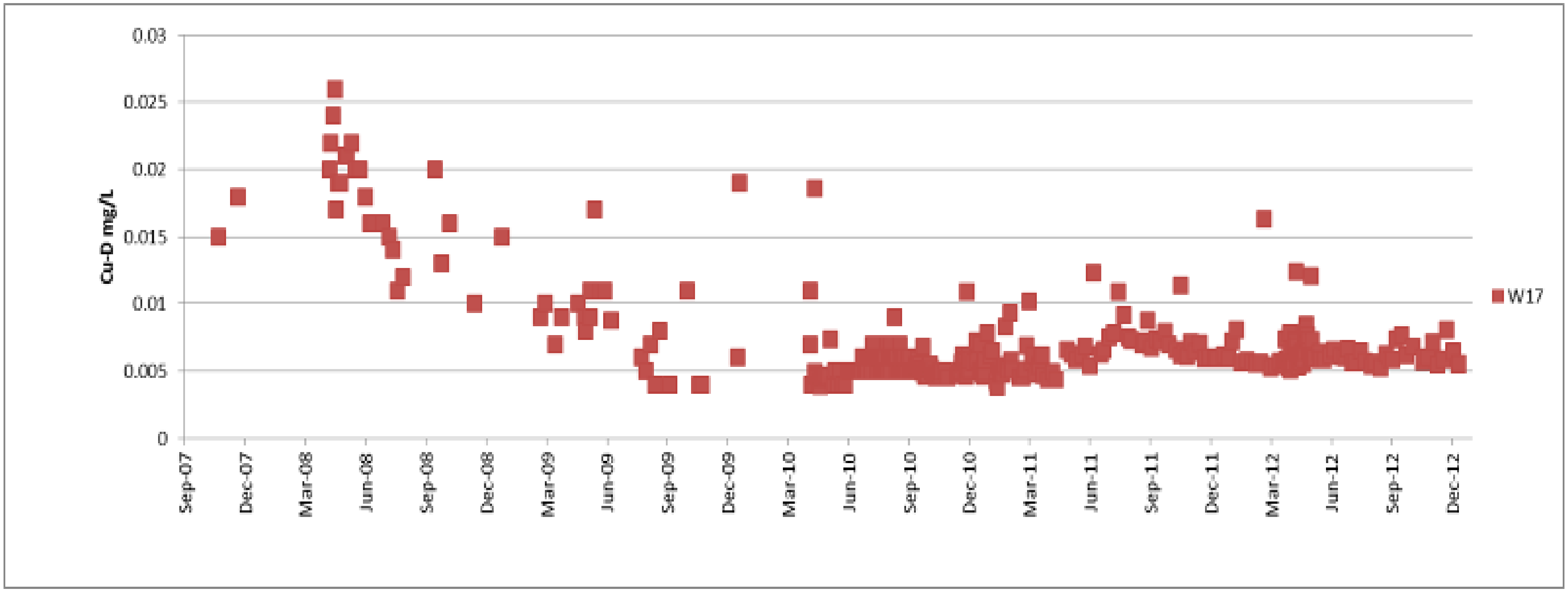

Figure 5-47: Dissolved copper concentrations at W17, 2007-2012.

5.4.5 Spring and Fall Seepage Monitoring for 2012

SS1- Toe of the Reclamation Overburden Dump NE corner

SS3- Toe of the Reclamation Overburden Dump SW corner

SS4- Toe of the Southwest Dump past W32

SS5, SS6, SS7, SS8- Toe of the Yellow Ore Stockpile adjacent to the DSTSF

SS9 and SS10 are in the ENE corner of the DSTSF

There have been changes in the nomenclature of the seasonal seepage monitoring locations in 2012. Therefore, only 2012 results have been displayed in this section. Moving forward, 2012 site names and locations will remain the same and new seeps will be documented accordingly. Seasonal seepage sites SS4 and SS7 exhibited water during spring and fall 2012 and all other seasonal seepage sites exhibited water only in the spring

Seasonal seepage site water quality results are displayed in Figures 5-48 to 5-54. Water quality parameters displayed include: dissolved copper (Figure 5-48), dissolved iron (Figure 5-49), dissolved cadmium (Figure 5-50), dissolved selenium (Figure 5-51), ammonia (Figure 5-52), nitrite (Figure 5-53), and nitrate (Figure 5-54).

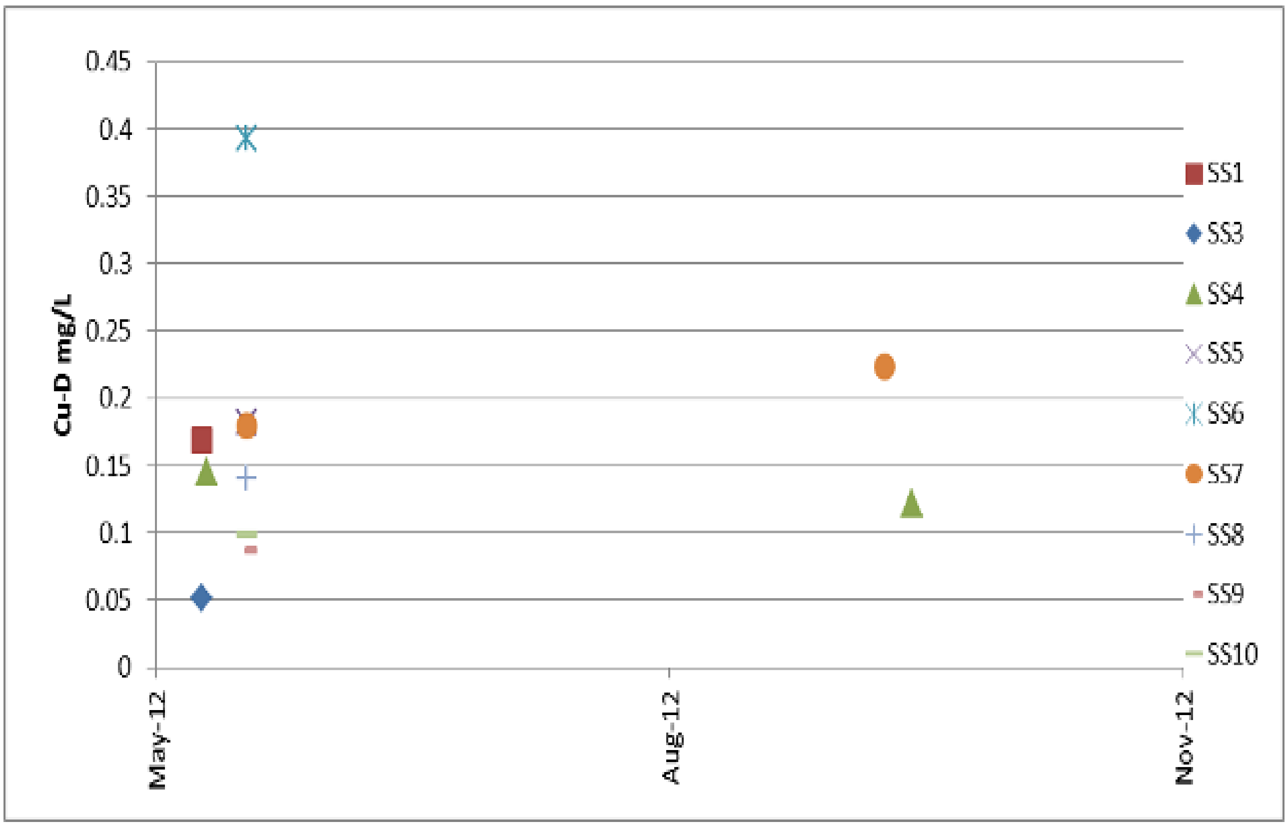

Figure 5-48: Seasonal seepage sites dissolved copper concentrations, 2012.

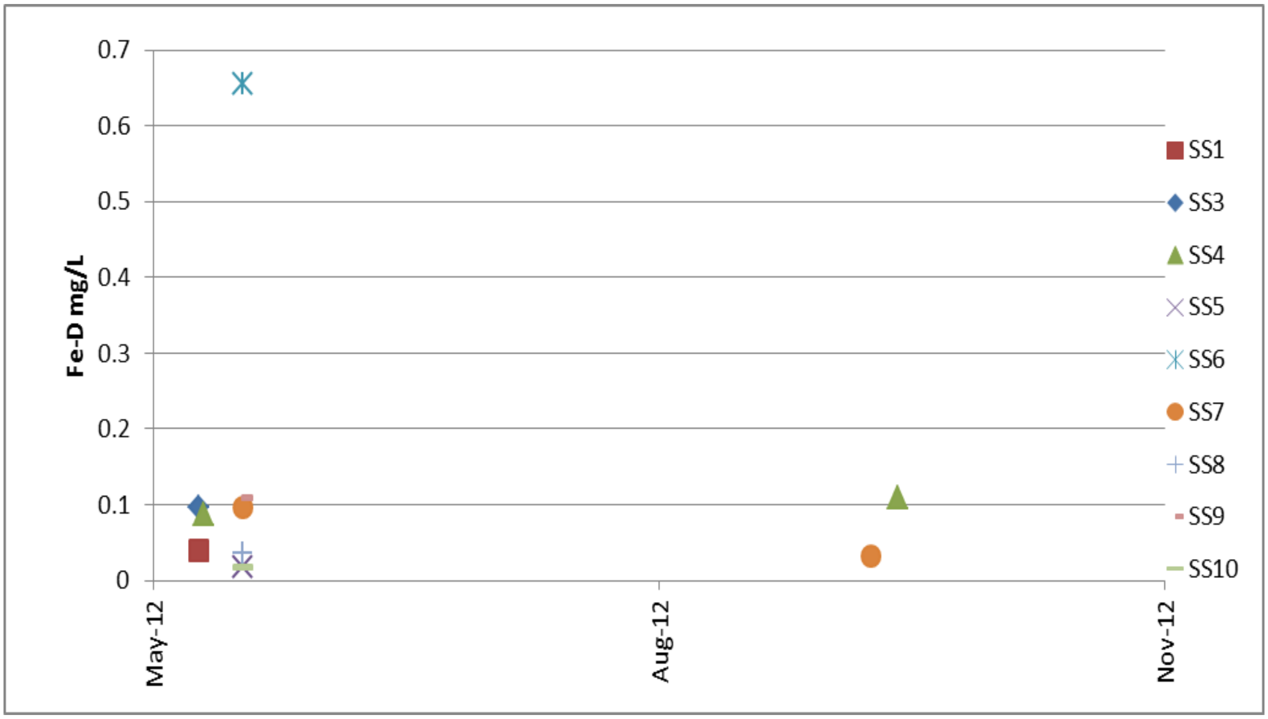

Figure 5-49: Seasonal seepage sites dissolved iron concentrations, 2012.

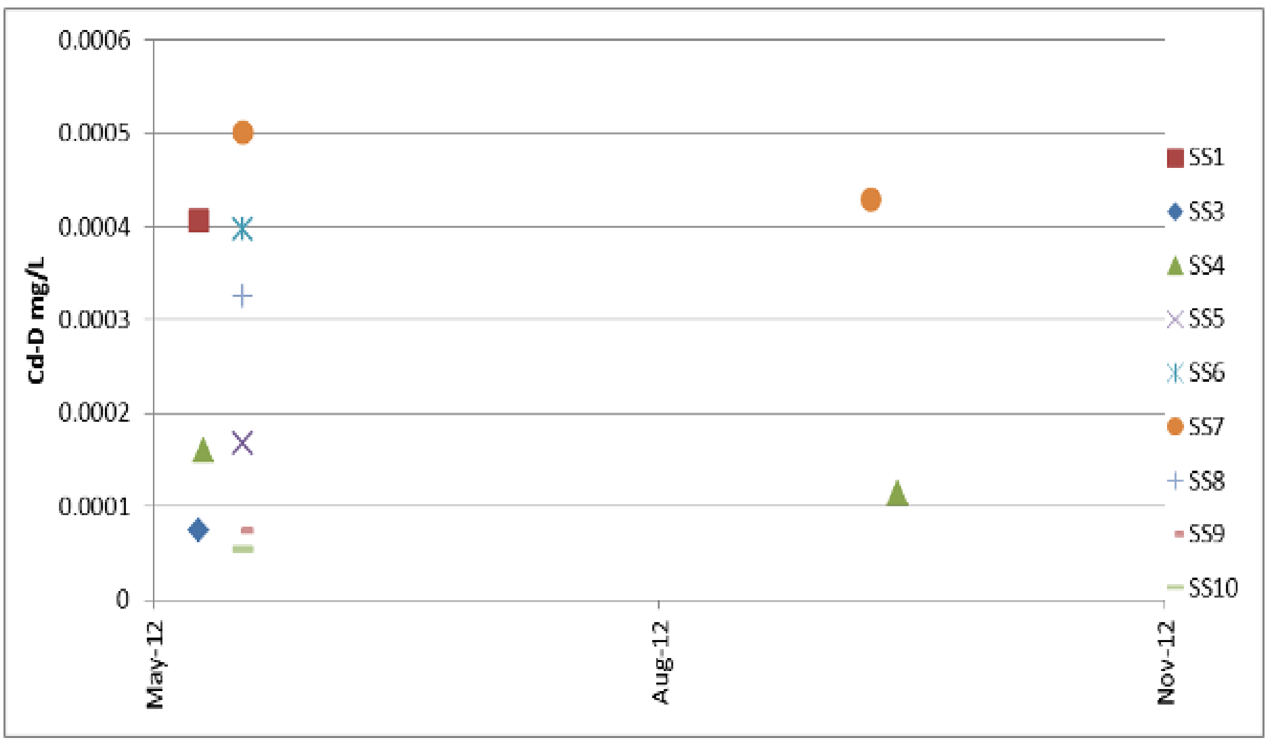

Figure 5-50: Seasonal seepage sites dissolved cadmium concentrations, 2012.

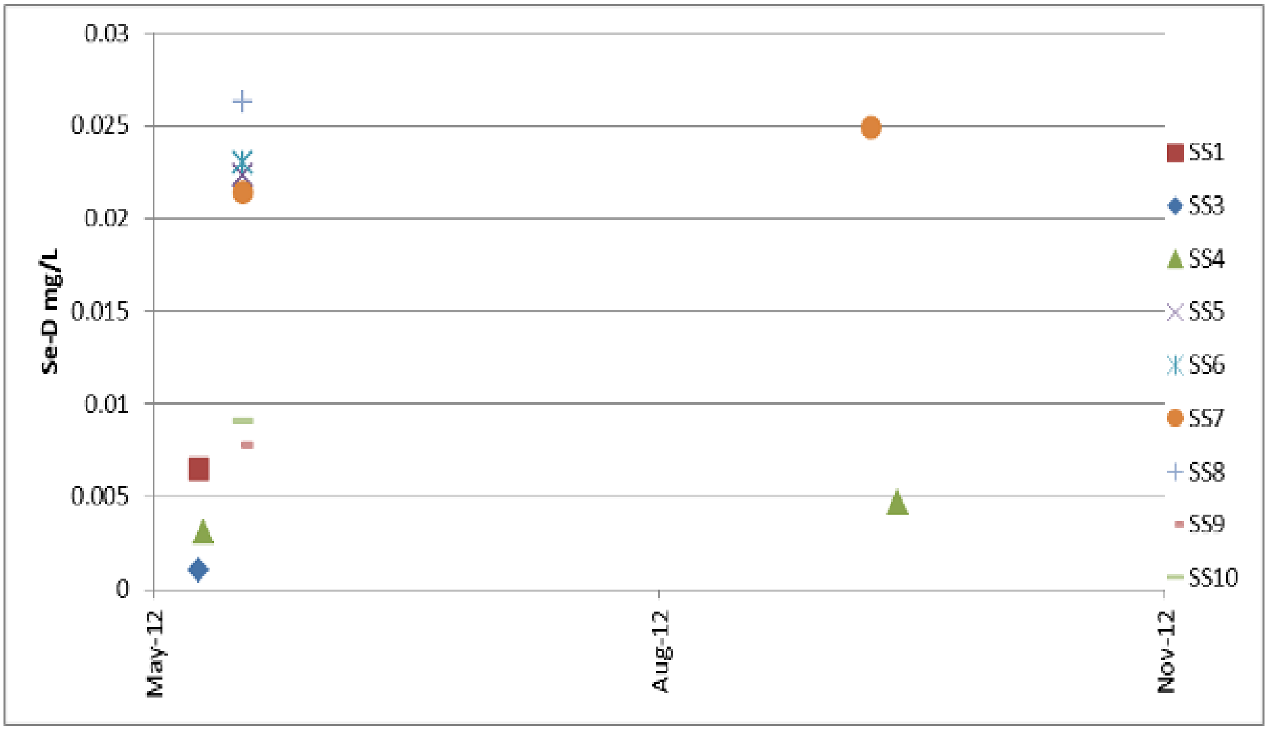

Figure 5-51: Seasonal seepage sites dissolved selenium concentrations, 2012.

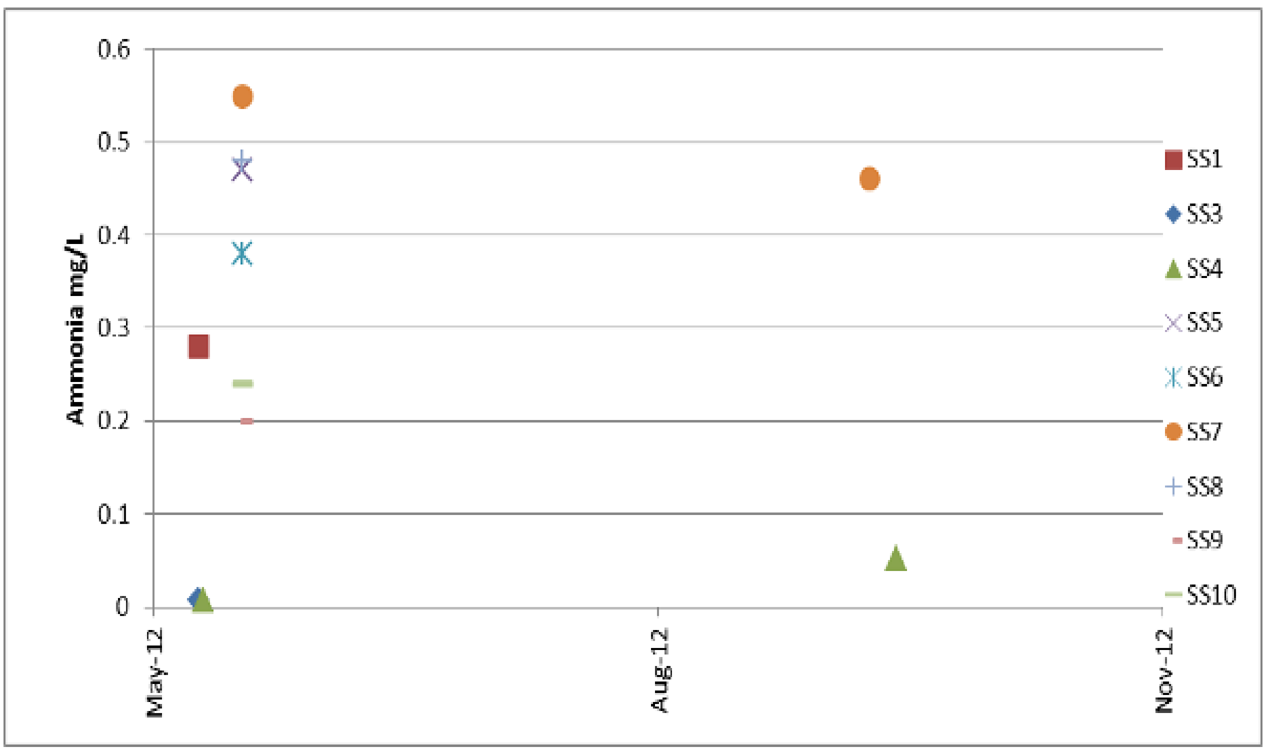

Figure 5-52: Seasonal seepage sites ammonia concentrations, 2012.

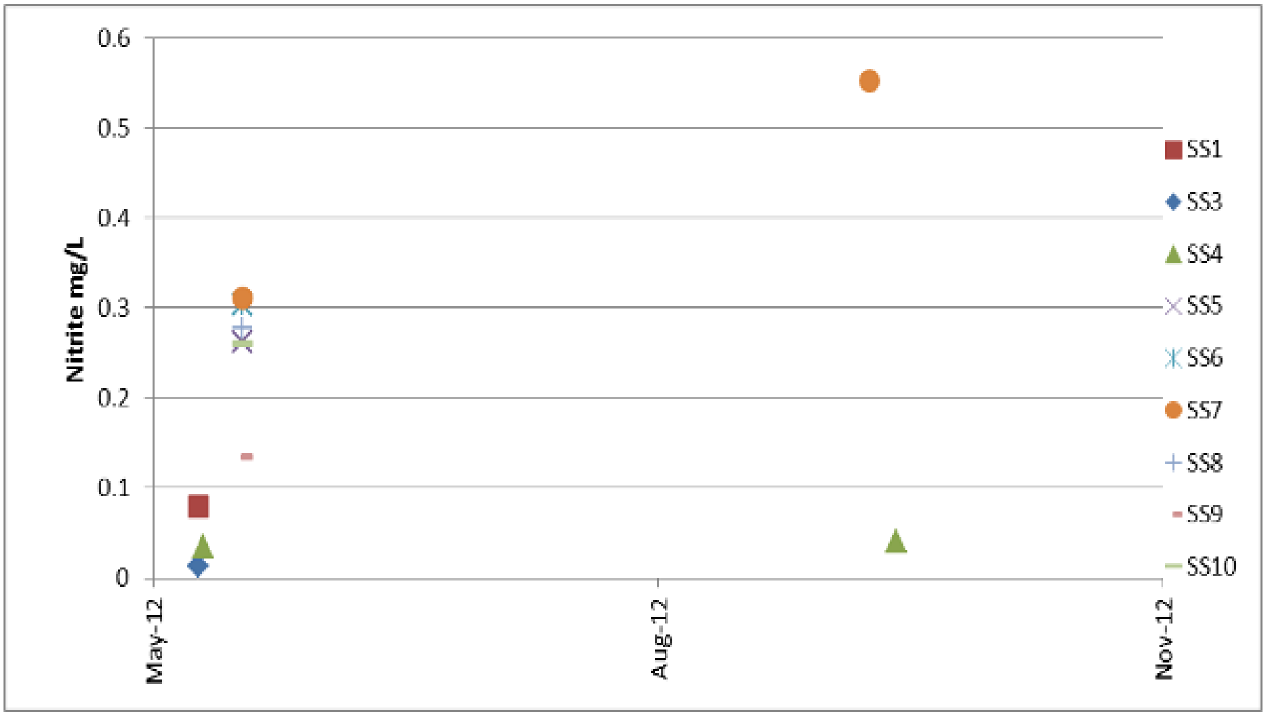

Figure 5-53: Seasonal seepage sites nitrite concentrations, 2012

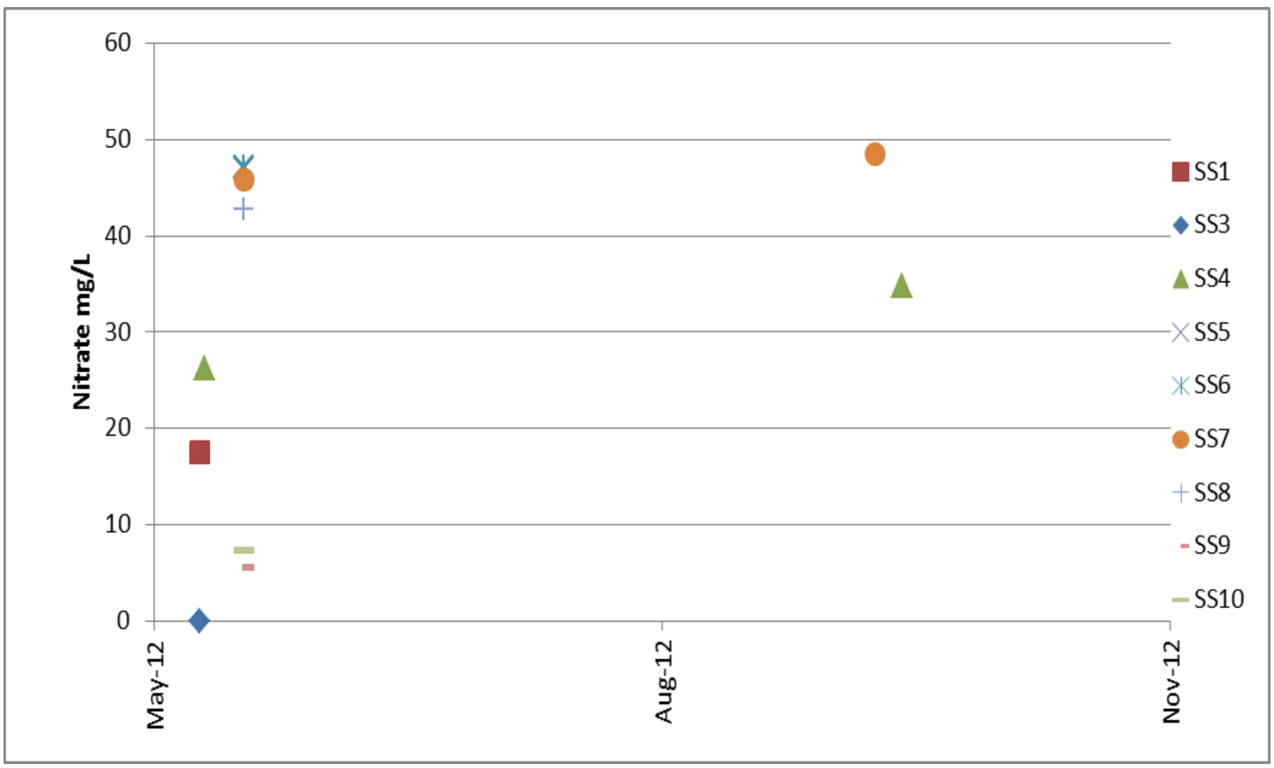

Figure 5-54: Seasonal seepage sites nitrate concentrations, 2012.

5.5 MCDS Seepage Monitoring Program

As required by Clause 84 and 85 of the WUL, Minto Mine is required to submit and implement a MCDS Seepage Monitoring Program and report the results of the program in the Annual Report. The MCDS Seepage Monitoring Program was submitted to the Yukon Water Board on January 15, 2013 and will be implemented on-site in the spring of 2013 with comprehensive results reported in the 2013 Annual Report.

5.6 Water Discharge

Minto Mine discharged approximately 171,000 m^3 of water to Minto Creek during the freshet period. The water discharged met the W16 end of pipe effluent standard for water quality during freshet, as outlined in the WUL. The total duration of discharging water was from April 13th to May 11th, 2012. The discharged water quality for the 2012 is summarized in Table 5-26; and additionally displayed in Figure 5-55 and Figure 5-56.

Minto Mine treated water in 2012 but did not discharge the treated water to the environment, as a WUL licence that included the area 2 pit processing had not been received. Once the licence had been received, natural water quality at W2 and seasonal conditions did not allow for further discharge. For further detail, see Section 9.1 of this report.

Table 5-26: 2012 W16A water quality results summary table.

W16A	Detection Limit	2012 Summary Statistics		
Physical Parameters		Mean	Minimum	Maximum
pH		7.45	7.10	7.86
Total Suspended Solids (mg/L)	1	4	3	8
Nutrients (mg/L)				
Ammonial Nitrogen	0.005	0.037	0.017	0.260
Nitrate Nitrogen	0.02	4.62	3.12	5.20
Nitrite Nitrogen	0.005	0.009	0.007	0.012
Total Metals (mg/L)				
Aluminum T-Al	0.005	0.212	0.106	1.020
Arsenic T-As	0.0001	0.0005	0.0004	0.0006
Cadmium T-Cd	0.00001	0.00003	0.00001	0.00010
Chromium T-Cr	0.001	0.001	0.001	0.001
Copper T-Cu	0.0002	0.0346	0.0269	0.0707
Iron T-Fe	0.005	0.314	0.159	1.220
Lead T-Pb	0.0002	0.001	0.000	0.003
Molybdenum T-Mo	0.001	0.005	0.004	0.006
Nickel T-Ni	0.001	0.001	0.001	0.002
Selenium T-Se	0.0001	0.0016	0.0011	0.0019
Zinc T-Zn	0.005	0.007	0.005	0.012

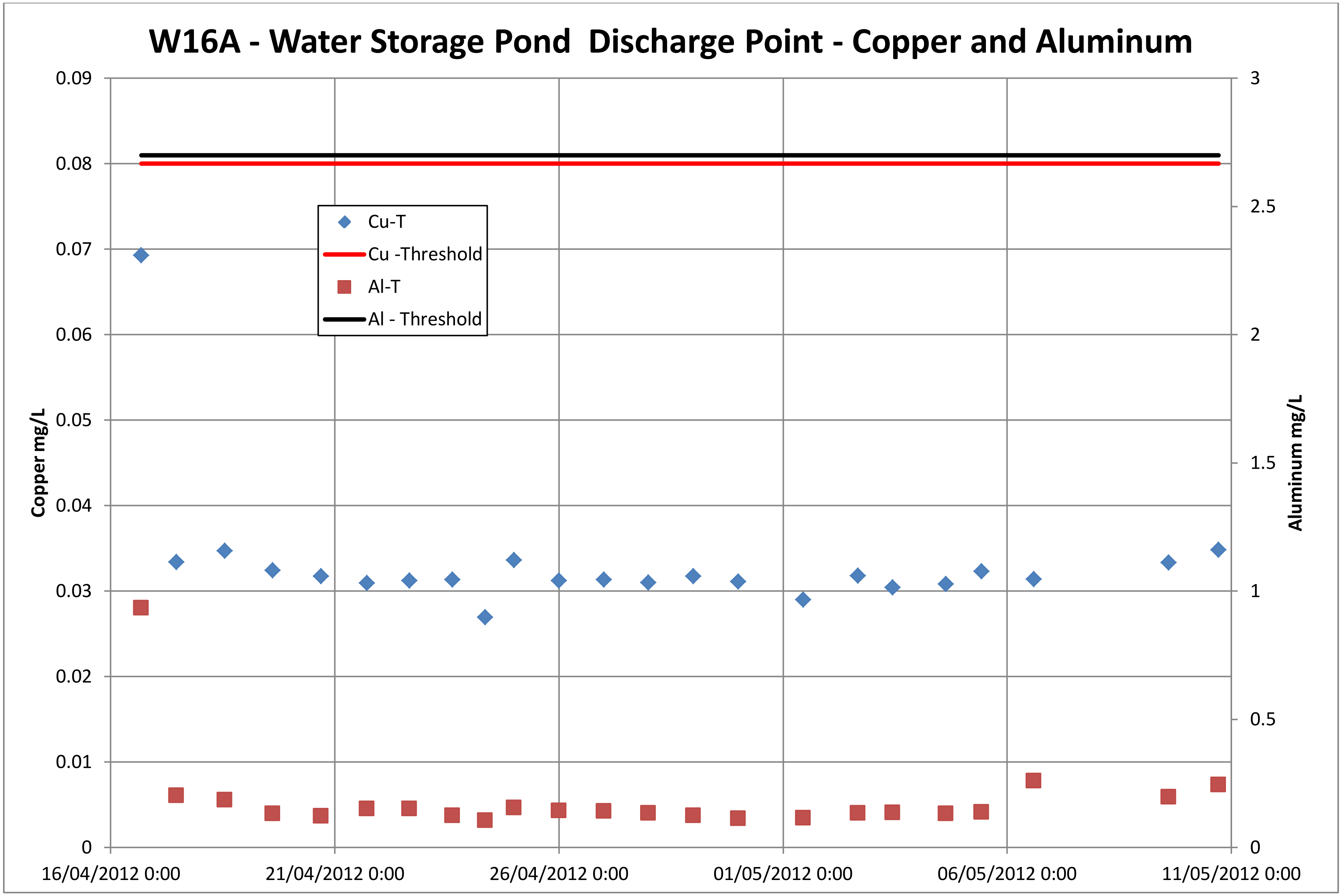

Figure 5-55 : 2012 W16A water quality for copper and aluminum with corresponding 2012 WUL thresholds.

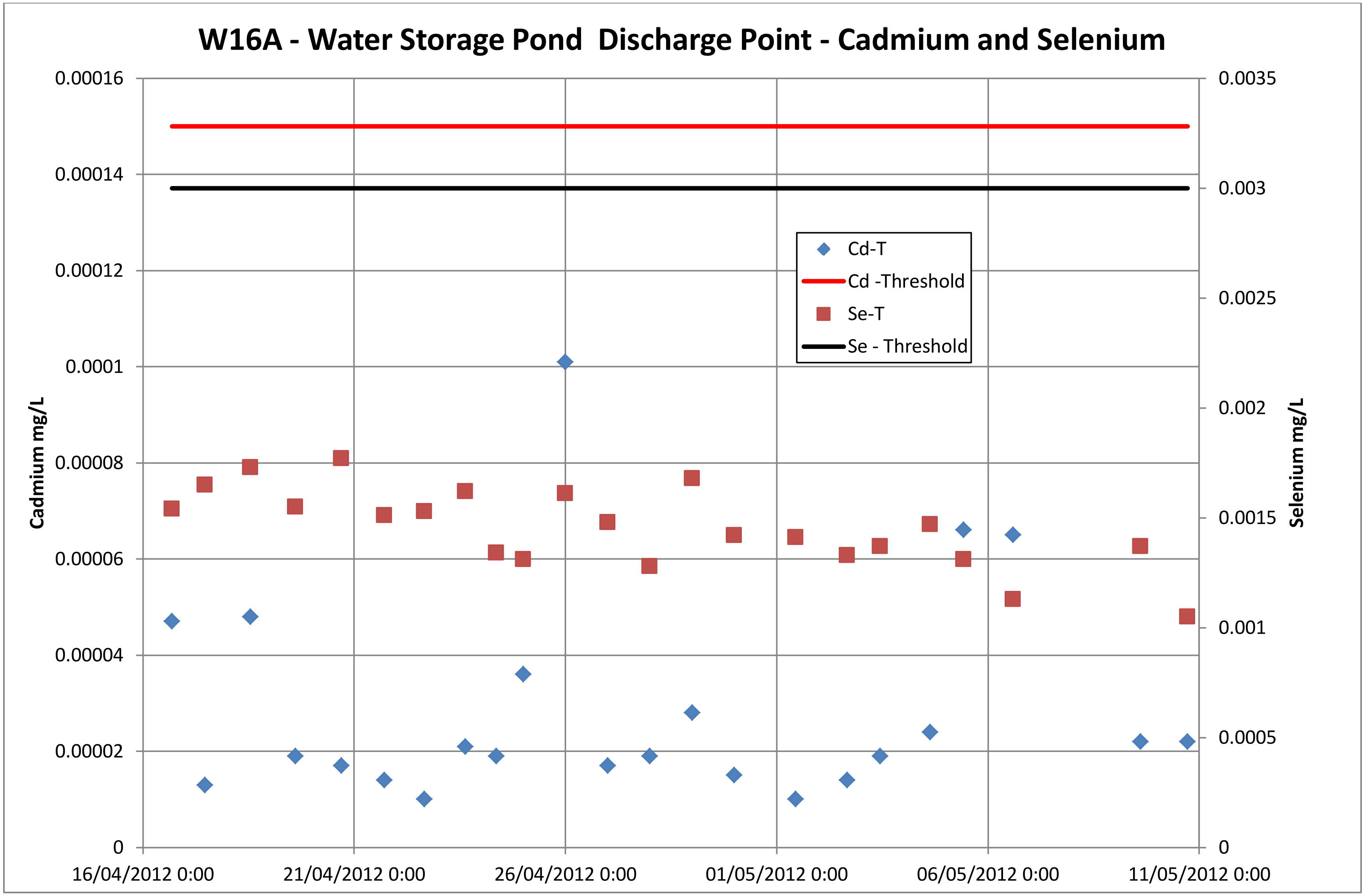

Figure 5-56: 2012 W16A water quality for cadmium and selenium with corresponding 2012 WUL thresholds.

5.7 Biological Monitoring Program

Clause 71 and 72 of the WUL requires an Annual Biological Monitoring Program that includes monitoring of sediment, periphyton, benthic invertebrates, fish and fish habitat. The following sections summarize the monitoring programs and more detailed reports can be found in Appendix D and Appendix E. Appendix D contains information with respect to the sediment, periphyton, chlorophyll a, and benthic invertebrate monitoring programs and Appendix E contains information relative to the fish monitoring programs.

5.7.1 Sediment Monitoring Program

The objectives of the sediment monitoring program were to characterize particle size of sediments collected from the lower Minto Creek receiving environment and reference (lower Wolverine Creek), and to characterize and evaluate concentrations of metals, metalloids and nutrients in receiving environment (upper and lower Minto Creek) and reference (upper McGinty Creek and lower Wolverine Creek) sediments. Sediments collected from lower Minto Creek and lower Wolverine Creek were mainly composed of silt sized particles (Table 5-27). Mean total organic carbon content of sediment collected from lower Minto Creek was approximately three times greater than in lower Wolverine Creek (Table 5-27). Concentrations of most analytes in receiving environment sediments were lower than sediment quality guidelines and/or similar to reference concentrations, with the exception of copper in upper Minto Creek, which was present at a mean concentration greater than the Canadian Sediment Quality Guidelines (CSGQ) Interim Sediment Quality Guideline (ISGQ) and was approximately three times greater than in upper McGinty Creek (the reference for upper Minto Creek; Table 5-27). Similar elevations of the ISQG for copper were apparent in previous years (Figure 5-57). Due to the predominantly erosional habitat in upper Minto Creek, there are relatively few areas where fine sediments are deposited and this only in small quantities that likely wash away each year during freshet. Therefore, elevated concentrations of metals in fine sediments of upper Minto Creek may be of limited importance in terms of exposure and potential toxicity to biota. In lower Minto Creek where fine sediment deposits were more common, sediment metal concentrations were generally below sediment quality guidelines and/or reference concentrations (Table 5-27). It is worth noting that the concentrations of many analytes in lower Minto Creek in 2012 were lower than in 2010 and 2011 (including copper; Figure 5-57), possibly due to inputs from non-mineralized areas with the catchment (e.g., bank instability in several tributaries).

Table 5-27: Sediment chemistry data collected at exposed and reference area, Minto Mine, 2012.

	Analytes	Units	CSQG [a]		Upper McGinty Creek		Lower Wolverine Creek		Upper Minto Creek		Lower Minto Creek	
			ISQG	PEL	Mean	Standard	Mean	Standard	Mean	Standard	Mean	Standard
Particle size, TKN, carbon analytes and pH	Loss on Ignition @ 550 C	%			-	-	21	4	-	-	8	3
	pH (1:2 soil:water)	pH units			7.04	0.20	7.27	0.33	7.98	0.21	8.08	0.08
	% Gravel (>2mm)	%			-	-	0.15	0.18	-	-	< 0.1	0.0
	% Sand (2.0mm - 0.063mm)	%			-	-	14.9	17.0	-	-	3.41	2.21
	% Silt (0.063mm - 4um)	%			-	-	74.1	14.7	-	-	86.6	2.1
	% Clay (<4um)	%			-	-	10.9	2.5	-	-	10.02	2.34
	Total Kjeldahl Nitrogen (TKN)	%			0.48	0.13	0.50	0.13	0.09	0.03	0.17	0.06
	Total Organic Carbon	%			-	-	9.6	2.1	-	-	3.41	1.54
Total Metals	Aluminum (Al)	mg/kg			14,960	1,222	17,780	2,091	11,206	1,274	10,758	1,082
	Antimony (Sb)	mg/kg			0.54	0.05	0.56	0.03	0.36	0.08	0.47	0.07
	Arsenic (As)	mg/kg	5.9	17	9.78	1.72	6.43	0.48	5.65	0.41	6.11	1.12
	Barium (Ba)	mg/kg			348	40	300	28	194	26	195	36
	Beryllium (Be)	mg/kg			0.49	0.05	0.86	0.06	0.42	0.08	0.40	0.07
	Bismuth (Bi)	mg/kg			< 0.2	0	< 0.2	0	< 0.2	0.0	< 0.2	0
	Cadmium (Cd)	mg/kg	0.6	3.5	0.245	0.051	0.344	0.031	0.172	0.028	0.142	0.041
	Calcium (Ca)	mg/kg			12,000	1,808	12,340	940	6,676	1,373	9,542	1,835
	Chromium (Cr)	mg/kg	37.3	90	31.4	2.3	53.9	5.7	26.3	2.8	21.7	2.7
	Cobalt (Co)	mg/kg			13.8	1.5	14.8	0.9	11	1	7.87	1.18
	Copper (Cu)	mg/kg	35.7	197	33.3	4.4	38.2	3.1	**114**	14.3	20.1	3.9
	Iron (Fe)	mg/kg			31,140	3,230	29,520	1,836	23,180	1,128	19,200	2,508
	Lead (Pb)	mg/kg	35	91.3	6.11	0.29	8.10	1.35	5.26	0.82	5.28	0.61
	Lithium (Li)	mg/kg			9.1	0.9	11.9	1.2	7.4	1.2	8.0	0.9
	Magnesium (Mg)	mg/kg			5,178	294	9,606	700	7,918	866	4,930	570
	Manganese (Mn)	mg/kg			1616	537	768	49	1612	370	457	132
	Mercury (Hg)	mg/kg	0.17	0.49	0.0707	0.0182	0.0597	0.0028	0.0190	0.0041	0.0327	0.0077
	Molybdenum (Mo)	mg/kg			0.73	0.23	0.52	0.01	1.23	0.26	0.55	0.07
	Nickel (Ni)	mg/kg			22.4	1.5	41.5	2.7	36.4	5.8	18.6	2.4
	Phosphorus (P)	mg/kg			971	74	981	26	994	30	792	41
	Potassium (K)	mg/kg			708	55	856	80	1254	118	800	121
	Selenium (Se)	mg/kg			0.65	0.14	0.60	0.04	0.35	0.09	0.25	0.07
	Silver (Ag)	mg/kg			0.13	0.01	0.14	0.01	< 0.1	0	< 0.1	0
	Sodium (Na)	mg/kg			202	8	310	12	378	54	244	27
	Strontium (Sr)	mg/kg			97.7	15.9	123	10	67.9	16.6	75.6	17.6
	Thallium (Tl)	mg/kg			0.0808	0.0030	0.0970	0.0121	0.066	0.012	0.073	0.015
	Tin (Sn)	mg/kg			< 2.0	-	< 2.0	-	< 2.0	-	< 2.0	-
	Titanium (Ti)	mg/kg			655	78	695	52	653	59	564	63
	Uranium (U)	mg/kg			1.57	0.27	2.72	0.07	0.634	0.169	0.83	0.18
	Vanadium (V)	mg/kg			59.8	3.6	70.7	4.3	52.2	2.8	41.8	4.7
	Zinc (Zn)	mg/kg	123	315	52.6	2.8	62.6	4.0	65.8	4.1	43.8	5.0

[a] Canadian Sediment Quality Guidelines - ISQG = interim sediment quality guideline; PEL = probable effect level (CCME 1999).

(blue) Indicates sediment concentration exceeding CSQG ISQG.

(green) Indicates sediment concentration exceeding CSQG PEL.

bold Indicates sediment concentraions exceeding the higher reference mean by more than 2 times

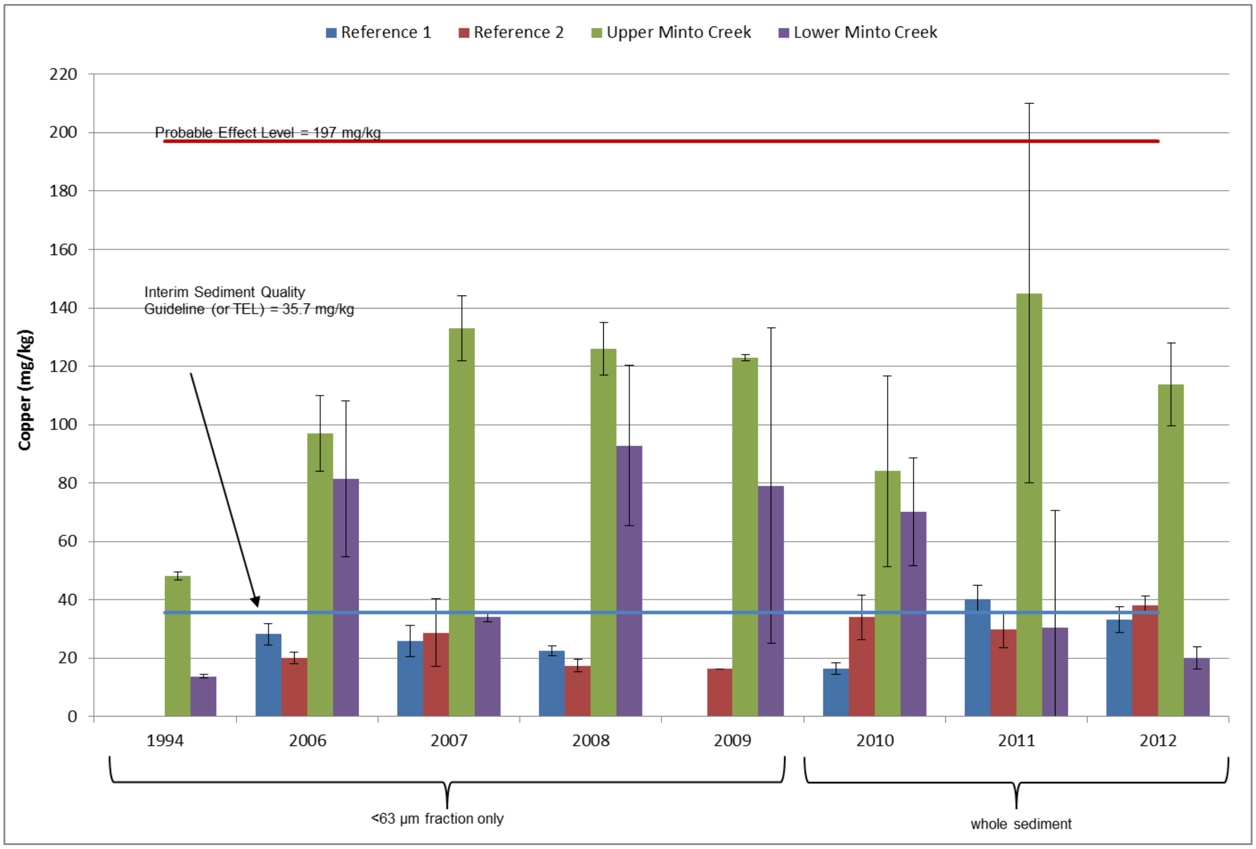

Figure 5-57: Mean copper concentrations in sediment collected in Minto Creek and reference location, 1994-2012 (mean ± standard deviation).

5.7.2 Periphyton and Chlorophyll a Monitoring

The productivity of lower Minto Creek and lower Wolverine Creek was assessed through collection of periphyton (e.g., algae attached to rocks) and measurements of chlorophyll *a* (used as a surrogate for the productivity of photosynthetic organisms). Chlorophyll *a* concentrations, evaluated on a surface area basis (i.e., mg chlorophyll *a* / m^2) were lower in Minto Creek than in Wolverine Creek, but the difference was no statistically significant due to high variability within the two areas (Figure 5-58). The differences were likely due to light penetration to the substrate rather than the influence of water quality, and concentrations were consistent with low to moderate productivity (e.g., were well below the British Columbia Guideline for the protection of aquatic life of 100 mg/m^2.

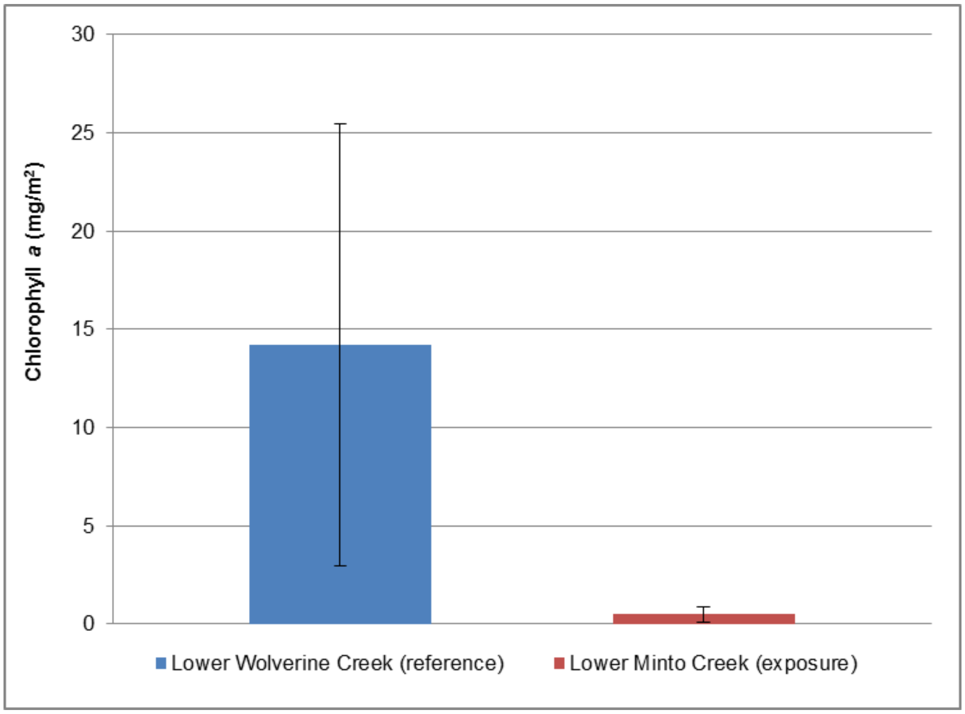

Figure 5-58: Mean chlorophyll a on cobble substrate in Lower Wolverine Creek and Lower Minto Creek (mean ± standard deviation), Minto Mine WUL, 2012.

5.7.3 Benthic Invertebrate Monitoring

The benthic invertebrate community in lower Minto Creek was evaluated and compared to lower Wolverine Creek for any potential mine-related effects. Control-impact comparison of benthic invertebrate data collected by Hess sampling demonstrated that the benthic invertebrate community of lower Minto Creek had lower density and higher taxon richness relative to lower Wolverine Creek (Table 5-28). In addition, lower Minto Creek had greater Bray-Curtis dissimilarity, lower percent Chironomidae (non-biting midges), and a lower score on the first axis of Correspondence Analysis (Table 5-28). The latter indicated greater relative community representation of naidid worms, *Sphaeromias* No-See-Ums, cyclopoid copepods, *Psectrocladius* chironomids, and flatworms in lower Minto Creek and greater relative community representation of *Taenioma* and perlodid stoneflies, the mayfly *Drunella spinifera*, and chironomids of the genus *Orthocladius* in lower Wolverine Creek (Appendix D).

Table 5-28: Benthic invertebrate community metrics and statistical comparisons, Minto Mine WUL, 2012.

	Lower Wolverine Creek (Reference)				Lower Minto Creek (Exposed)				Statistical Comparisons		
	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum	Significant Difference Among Areas? (p-value)[a]		Magnitude of Difference (# of SDs)[b]
Density (individuals/m^2)	7,579	2,872	5,113	12,340	856	495	370	1,657	YES	0.001	-2.3
Number of Taxa	12.6	2.1	10	15	20.4	2.1	18	23	YES	0.000	3.8
Simpson's Diversity (Environment Canada 2012)	0.51	0.20	0.30	0.82	0.74	0.09	0.63	0.83	YES	0.050	1.1
Simpson's Evenness (Environment Canada 2012)	0.20	0.12	0.12	0.40	0.20	0.05	0.15	0.26	NO	0.981	~
Bray-Curtis Distance to the Wolverine Creek Median	0.25	0.16	0.06	0.46	0.91	0.02	0.89	0.94	YES	0.000	4.1
Percent EPT (mayflies, stoneflies and caddisflies)	11.4	3.7	8.0	16.9	23.5	14.3	6.6	42.9	NO	0.103	~
Precent Chironomids (non-biting midges)	75.1	12.5	61.6	90.2	51.5	11.1	39.4	64.2	YES	0.014	-1.9
Percent Oligochaetes (worms)	11.1	11.4	0.0	25.5	7.8	4.5	2.4	14.4	NO	0.558	~
Percent Nemata (roundworms)	0.7	0.5	0.0	1.2	4.9	7.9	0.0	18.9	NO	0.272	~
Correspondence Analysis Axis-1 (38.2% of community variance)	0.60	0.06	0.54	0.68	-0.87	0.17	-1.01	-0.63	YES	0.000	-26.2
Correspondence Analysis Axis-2 (14.1% of community variance)	0.01	0.14	-0.22	0.16	-0.09	0.71	-0.80	1.06	NO	0.749	~
Correspondence Analysis Axis-3 (12.1% of community variance)	0.07	0.59	-0.41	0.93	0.02	0.26	-0.21	0.45	NO	0.885	~

Comparisons of benthic invertebrate community metrics in 2012 to those documented in previous years indicated substantial temporal variability at the receiving environment and reference areas, possibly due to inter-annual variability in environmental conditions (e.g., flow, ice scour) and/or differences in collection methods/replication between studies (Figure 5-59). In fact, the direction of several control-impact differences observed 2012 were opposite from those observed in 2011. For example, density was lower and taxon richness higher at Minto Creek than in Wolverine Creek in 2012, but the opposite was observed in 2011. This suggests that natural temporal variability may be greater than any variability caused by mine activity.

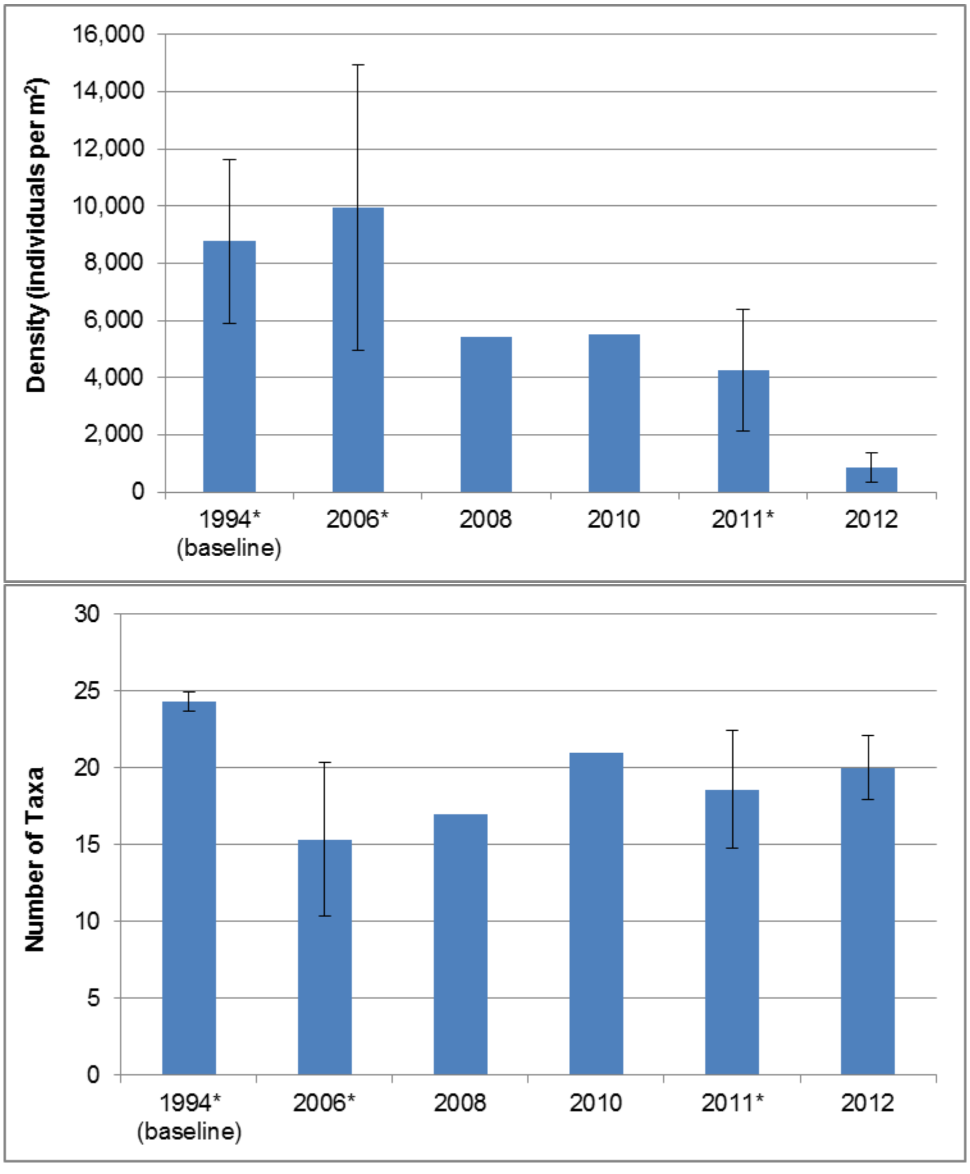

Figure 5-59: Benthic invertebrate community density and taxon richness at Lower Minto, Minto Creek, 1994 -2012. Data presented as mean ± standard deviation where replicated. Asterisk (*) indicates a year the mine was not discharging.

5.7.4 Fisheries Monitoring Program

In partial fulfillment of the Biological Monitoring Program as required under Clause 86 of WUL, Minto Mine retained Access Consulting Group of Whitehorse, Yukon to conduct a fish and fish habitat assessment program in lower Minto Creek. Previous fish studies in Minto Creek have delineated the extent of fish habitat in the system, identified the species of fish that use the system and the type and timing of use.

Sampling in 2012 consisted of deployment of baited gee-type minnow traps using trapping sites consistent with past studies and one electrofishing event. Sampling was conducted monthly from June to September 2012. All fish captured were identified, enumerated and measured (length), weighed, inspected for abnormalities and released at the vicinity of their trapping location. Additional data collected during sampling events included water temperature, flow, staff gauge reading, conductivity, pH, dissolved oxygen and oxygen reduction potential (ORP). The 2012 study details and results are presented in Appendix E.

In Minto Creek, very few fish were captured throughout the study. The predominant species captured, were slimy sculpins followed by juvenile Chinook salmon and Arctic grayling. The low numbers of fish captured (9 slimy sculpins, 3 Chinook salmon, 1 Artic grayling) throughout the study is consistent with fish usage numbers in the system during years the mine was not discharging into the creek and prior to mine operations. Big Creek was also sampled on three occasions during 2012. A total of 33 fish were captured, eight of which were juvenile Chinook salmon.

Very few fish (8 in total) were captured during the first sampling event in mid-June (included both electrofishing and trapping efforts) indicating, as determined in previous studies, that fish do not likely enter the creek until after June. A natural fish barrier (composed of large organic debris) that impedes passage of fish upstream was identified during a 2010 assessment. This barrier, located approximately 1.2 km upstream from the Yukon River, was still in place during the 2012 study and continues to impede fish passage (i.e. traps set upstream of the barrier did not result in the capture of any fish).

No fish were observed to use the mouth of Minto Creek or the Yukon River immediately in the vicinity of the mouth for spawning as determined through an aerial reconnaissance survey conducted over the Minto Creek/Yukon River confluence in September.

5.8 Meteorological Monitoring Program

Minto Mine has two meteorological stations located approximately 70 m northeast of the north end of the airstrip. Both stations are located in an area that allows ample meteorological exposure from all directions. Trees are clear for a radius of 30 m from both meteorology stations and beyond that radius is a sparse growth of 2 m tall conifers.

The first meteorology station known as Met Station 1 was installed September 18, 2005 and records data on a HOBO datalogger. Met Station 1 consists of a three m tripod with instrumentation to measure air temperature, relative humidity, barometric pressure, incident solar radiation and rainfall (wet precipitation). Data is averaged over the one-hour archiving period and then is saved to the datalogger.

The second meteorology station known as Met Station 2 was installed October 15, 2010 and runs on a Campbell Scientific CR1000 datalogger. Met Station 2 consists of a 10 m tower with instrumentation to measure air temperature (Figure 5-60), precipitation – rain and snowfall (Figure 5-61), wind speed and direction (Figure 5-62), incident solar radiation (Figure 5-63), relative humidity (Figure 5-64) and barometric pressure (Figure 5-65). Data is averaged over the one-hour archiving period and then saved to the datalogger. The 2012 meteorological data is summarized in Table 5-29.

During the 2012 reporting period Met station 1 recorded no system interruptions. Met Station 2 did not have any total system interruptions in 2012; however, there were operational issues with the wind meter and precipitation gauge. From November 10, 2012 through the remainder of the year the wind speed and direction data were sparsely recorded. It is believed that the reason for the recording gap in wind data was from the wind meter icing up. Due to operational issues with the snow conversion adaptor, the precipitation data from the beginning of 2012 is not considered to be accurate. In addition, the transition from the snow conversion adaptor to rain collection adaptor was not completed until June 1, 2012 causing a delay in rain collection/measurement. In 2012, Minto Mine programed Met Station 2 to calculate the evaporation; however, due to calibration errors the accurate measurement of evaporation did not begin until mid-October and will be presented in the 2013 Annual Report.

Table 5-29: Summary of 2012 meteorological data (Met Station 2 data).

Metrological Data Summary				
	Minimum	Maximum	Mean	Median
Temperature (^{o}C)	-36.64	26.04	-2.53	0.50
Precipitation (mm)	0.00	9.90	0.03	0.00
Wind Speed (m/s)	0.00	16.64	2.82	2.22
Wind Direction (360 Degrees)	0.00	359.90	163.94	151.60
Solar Radiation (W/m^2)	0.00	800.00	103.00	3.00
Relative Humidity (%)	15.00	99.80	67.72	70.66
Barometric Pressure (hPa)	979.41	1031.27	1007.52	1008.43

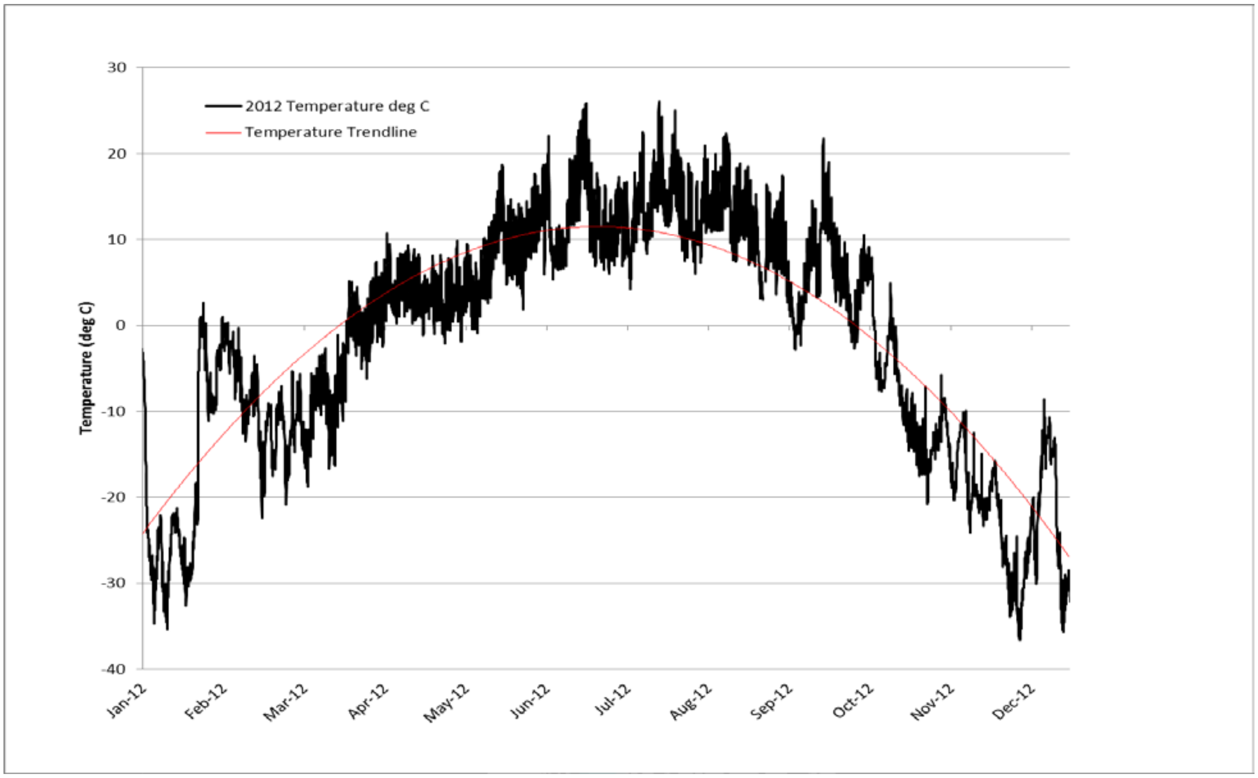

Figure 5-60: Minto Mine 2012 temperature data.

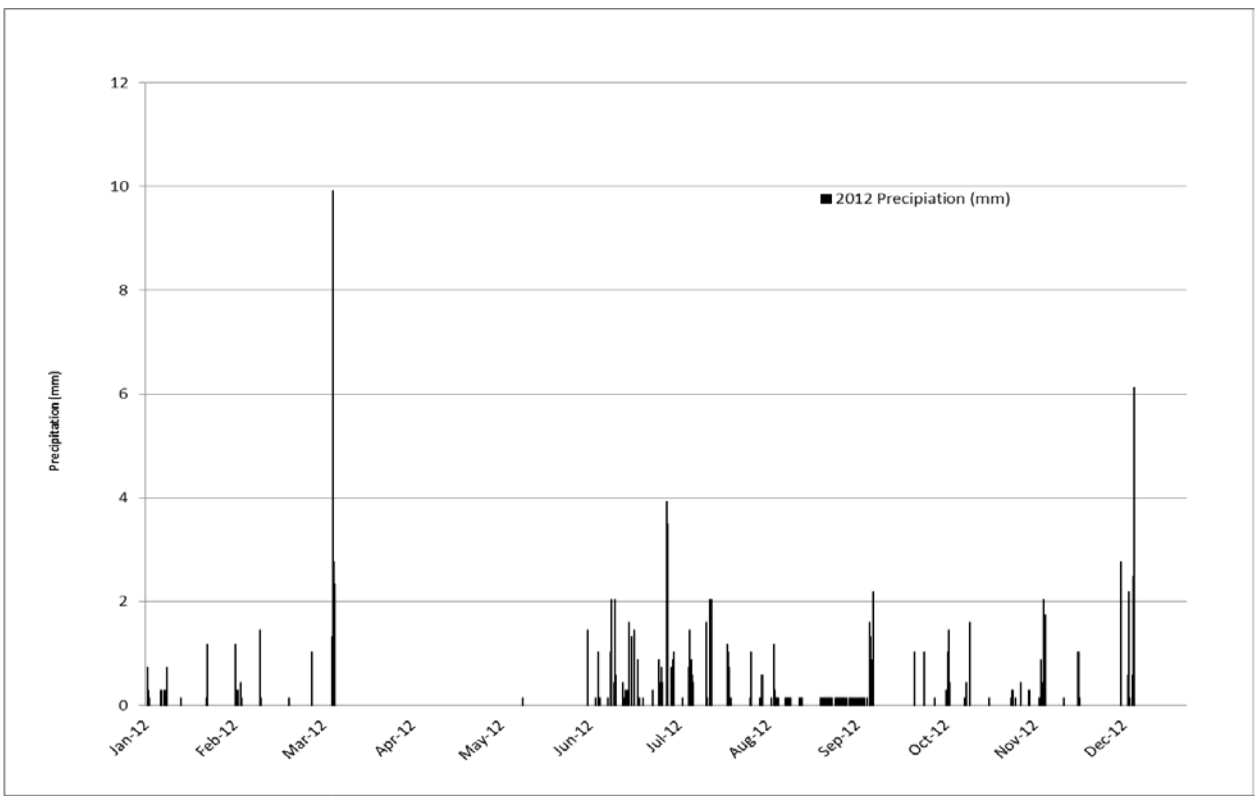

Figure 5-61: Minto Mine 2012 precipitation data.

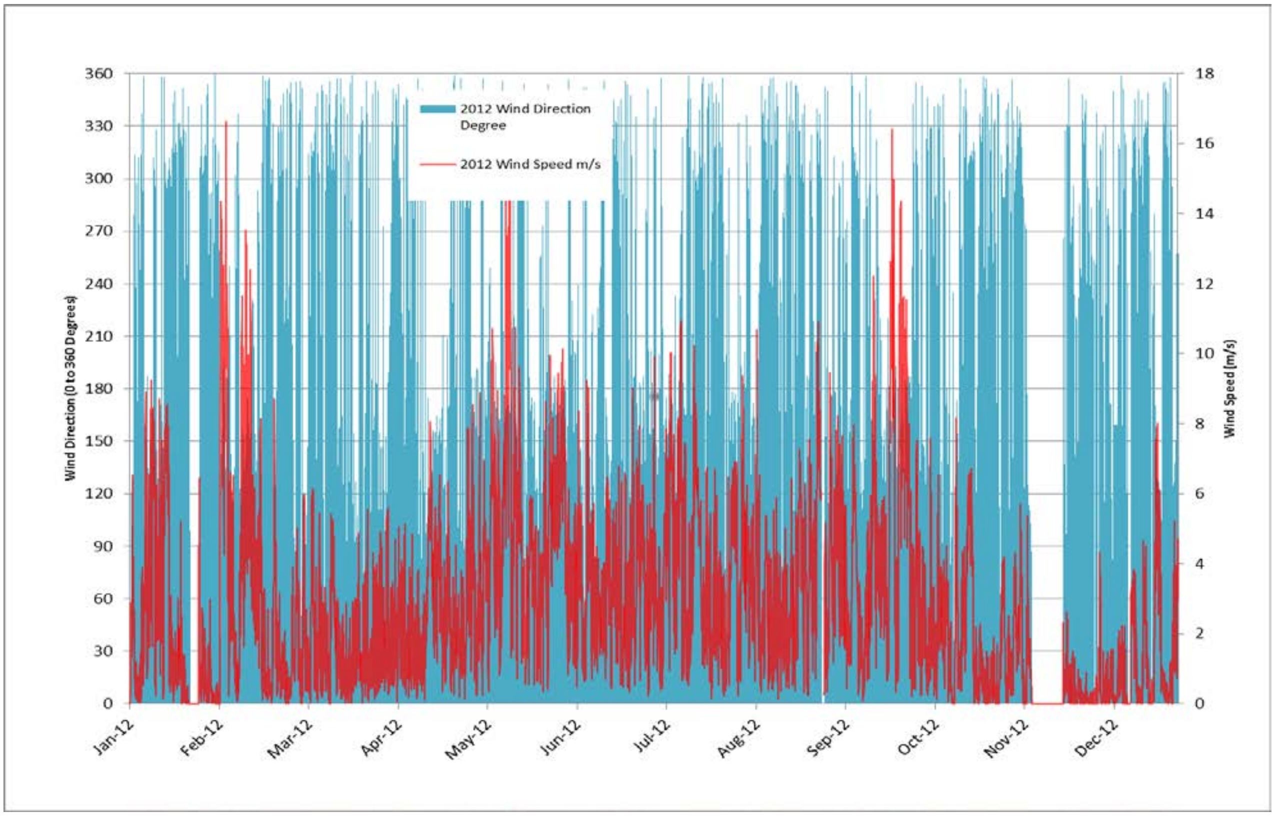

Figure 5-62: Minto Mine 2012 wind speed and direction.

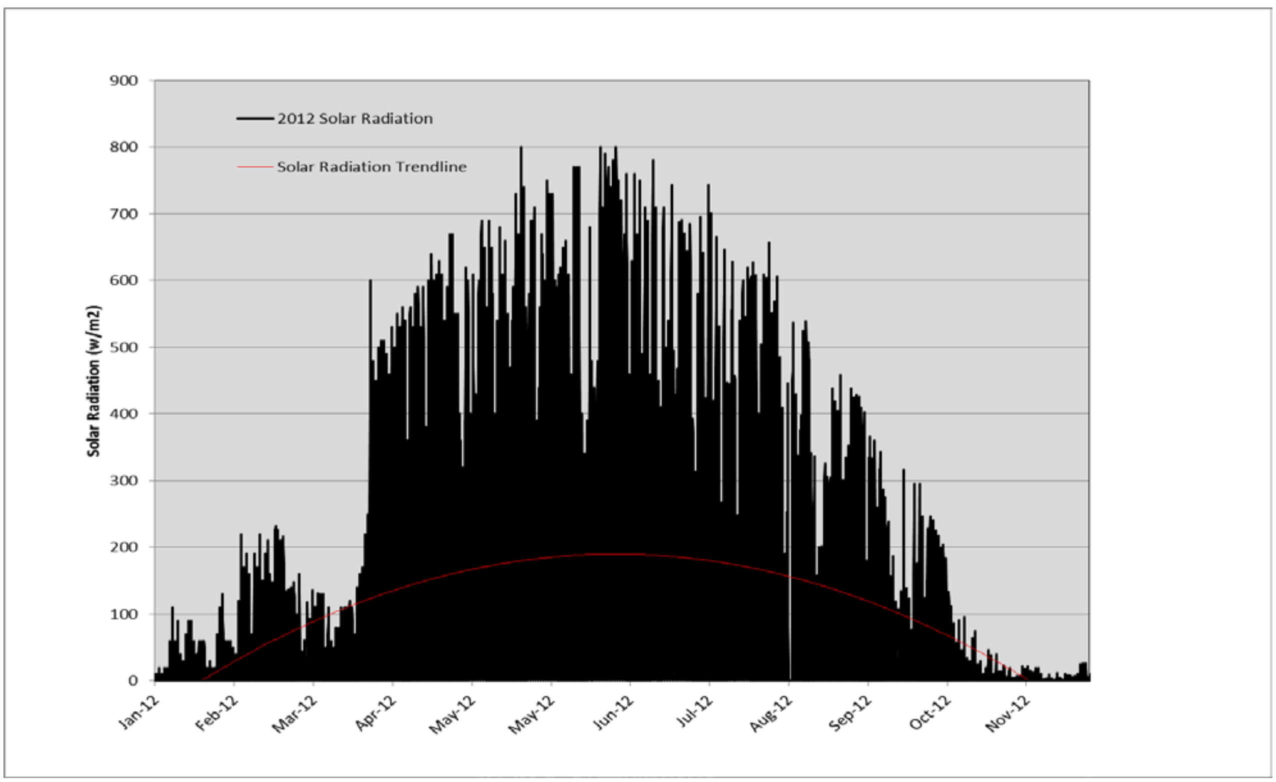

Figure 5-63 : Minto Mine 2012 solar radiation data.

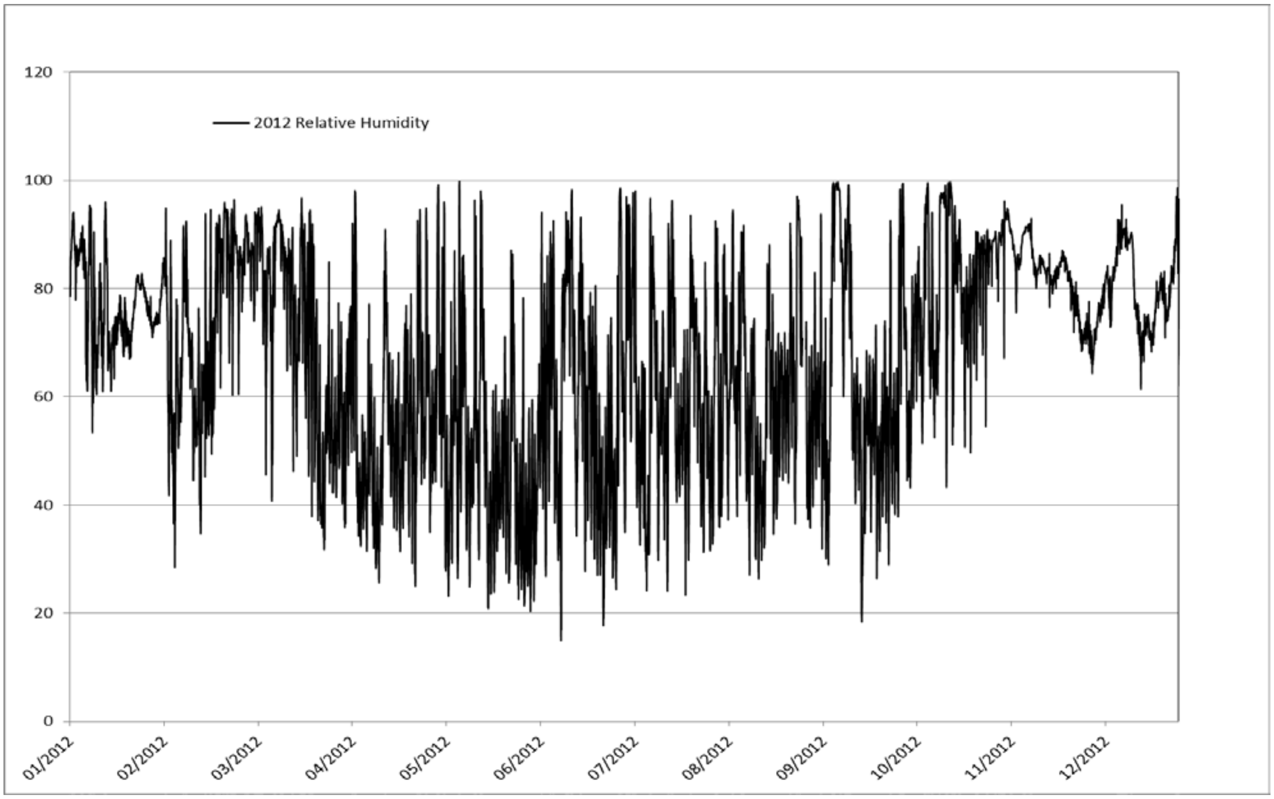

Figure 5-64: Minto Mine 2012 relative humidity data.

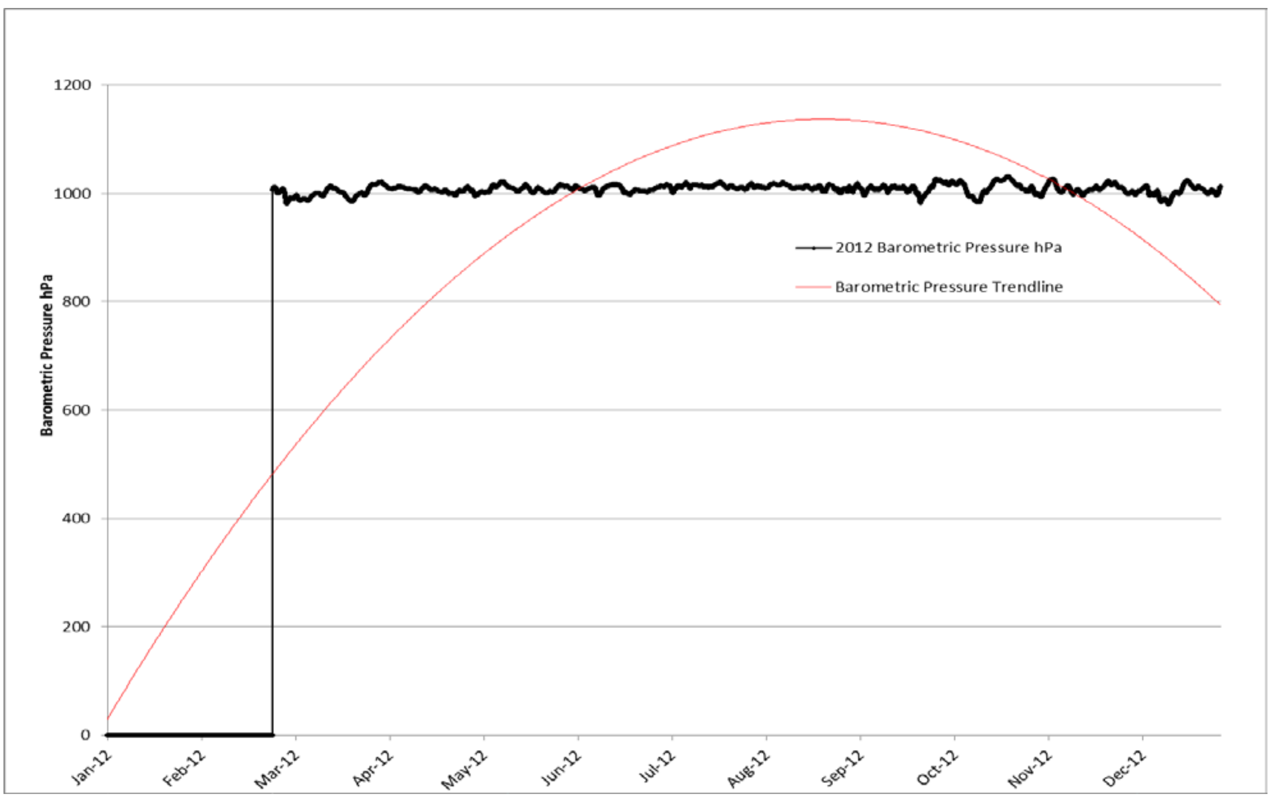

Figure 5-65: Minto Mine 2012 barometric pressure data.

5.9 Adaptive Monitoring and Management Plan

As required by Clause 93 of the WUL, Minto Mine is to review and update the *Adaptive Monitoring and Management Plan* (AMMP) on an annual basis and submit the updated plan as part of the Annual Report. See Appendix F for the updated AMMP.

Clause 94 of WUL requires that Minto Mine submit an assessment of the receiving water quality standard for copper of 0.013 mg/L, the effectiveness of the AMMP during freshet and non-Freshet conditions and the overall effect of the site discharge management regime on the aquatic ecosystem. See Appendix G for the aforementioned assessment.

5.10 Quality Assurance and Quality Control Program

As required by Clause 18(l) of WUL Minto Mine is required to submit the results and interpretations of the Quality Assurance and Quality Control Program (QA/QC Program). The QA/QC program is directed through the *Minto Mine Quality Assurance and Quality Control Plan*. Implementation of the Minto Mine QA/QC Program occurred in November 2012 upon completion of the *Minto Mine Quality Assurance and Quality Control Plan*.

The primary objective of the QA/QC Program is to ensure that data collected, analyzed and evaluated through the environmental monitoring programs at the Minto Mine are representative of the environmental conditions present at the time of sampling. The *Minto Mine Quality Assurance and Quality Control Plan* has been developed using recognized QA/QC protocols. Specific procedures for data collection at the Minto Mine are detailed in Standard Operating Procedures (SOPs) included as Appendices to the *Minto Mine Quality Assurance and Quality Control Plan*. SOPs are internal documents to the Minto Mine that may be modified or improved as the QA/QC Program becomes further established.

The main components of the QA/QC Program presented in the following sections include QA/QC results and interpretations with regards to water quality monitoring, external and on-site laboratory reporting, and environmental programs monitoring.

5.10.1 Water Quality QA/QC

Procedures for water quality monitoring at the Minto Mine are detailed in the *Minto Mine Surface Water Quality Monitoring Standard Operating Procedures*. December 2012 updates to the Water Quality SOP included a revised Water Quality Field Form and the addition of the procedure for triple-rinsing sample bottles (triple-rinses were conducted in the field although not described in the SOP). Additionally, an YSI Calibration Procedure was drafted in December 2012 and is currently under review.

In November and December 2012, approximately 124 routine water quality samples were collected for the water quality surveillance program. Quality control samples represented 10.5% of the total number of samples collected in November and December 2012, as presented in Table 5-30. The *Minto Mine Surface Water Quality Monitoring Standard Operating Procedures* describes a 1:10 routine sampling to quality control sampling ratio and this ratio was achieved during November and December 2012. Trip blanks were not used during this time period and further efforts will be made to ensure that field staff collect a variety of quality control samples, including trip blanks.

Table 5-30: December and November 2012 Minto Mine quality control sampling summary for water quality.

December and November 2012 Minto Mine Quality Control Sampling Summary for Water Quality			
Water Quality Samples	**Field Duplicates**	**Field Blanks**	**Trip Blanks**
124	8	5	0

5.10.2 External Laboratory QA/QC

November and December 2012 external laboratory water sample analysis were performed by Maxxam Environmental in Burnaby, BC. As described in the the *Minto Mine Quality Assurance and Quality Control Plan*, all results provided by the external laboratory were accompanied by a Quality Assurance Report. Details of deviations from procedure, exceedances in standard holding time, and a QC batch number for traceability were further included with each report.

5.10.3 On-site Laboratory QA/QC

Procedures for analyzing water samples at the on-site laboratory are detailed in a variety of SOPs such as, but not limited to *Lab QA/QC Guidelines SOP*, *Preparation of Dissolved and Total Metals SOP (Cu, Al, Cd) SOP, Preparation of Dissolved and Total Selenium SOP*, and *Total Dissolved Solids SOP*. There were no updates made to the on-site laboratory SOPs in November and December 2012. All on-site laboratory equipment was calibrated according to manufacturer's specifications during November and December 2012.

December 2012 on-site laboratory analysis of water quality samples included samples from stations W3, W8 and W8A. The on-site laboratory did not report any difficulties with QA/QC during and December 2012.

5.10.4 Environmental Monitoring QA/QC

Hydrology QA/QC

Procedures for hydrology monitoring at the Minto Mine are detailed in the *Minto Mine Surface Water Hydrology Standard Operating Procedures*. There were no updates made to the hydrology SOP in November or December 2012. Hydrology data collection in November and December 2012 was minimal as Minto Creek was found to be frozen at most hydrology stations.

Meteorology QA/QC

Procedures for meteorology monitoring at the Minto Mine are detailed in the *Meteorology Station Download Procedures*. There were no updates made to the meteorology download procedures in November or December 2012. Data downloads are performed monthly and data is reviewed after the download to ensure that the meteorological stations are recording all necessary parameters.

Hydrogeology QA/QC

Procedures for hydrogeology monitoring at the Minto Mine are detailed in the *Minto Mine Groundwater Monitoring Plan Version 2011-01*. The *Minto Mine Groundwater Monitoring Plan Version 2011-01* is currently under review, as required by Clause 96 of the WUL Discussion of the review is not provided in this section as the plan has not been finalized.

In November 2012, 14 groundwater samples were taken at the Minto Mine. Quality control samples represented 21% of the total number of samples collected in November and December 2012, as presented in Table 5-31. The *Minto Mine Groundwater Monitoring Plan Version 2011-01* recommends field duplicate sampling be conducted at a frequency of one field duplicate sample per ten groundwater monitoring samples; a higher rate of field duplicate sampling was achieved in November 2012. Additionally the *Minto Mine Groundwater Monitoring Plan Version 2011-01* states that "one field blank sample will be collected during each Spring/Fall groundwater monitoring event". The 2012 fall groundwater sampling did not obtain a field blank sample and effort will be made to ensure that field staff collect the appropriate quality control samples as detailed in the *Minto Mine Groundwater Monitoring Plan Version 2011-01*.

Table 5-31: December and November 2012 Minto Mine quality control sampling summary for hydrogeology.

December and November 2012 Minto Mine Quality Control Sampling Summary for Hydrogeology			
Hydrogeology Samples	**Field Duplicates**	**Field Blanks**	**Trip Blanks**
14	3	0	0

5.11 Groundwater Monitoring Program

As required by Clause 18(f) of the WUL Minto Mine is required to submit the results, including data collected, for the Groundwater Monitoring Program. The Groundwater Monitoring Program is directed through the *Minto Mine Groundwater Monitoring Plan Version 2011-01*.

The primary monitoring objective of the *Minto Mine Groundwater Monitoring Plan Version 2011-01* is to provide for monitoring of potential impacts on groundwater from the Minto Mine components including the DSTSF, Mill area, Area 1 Pit, Main Waste Dump, Southwest Dump, and Water Storage Pond. Additionally, the *Minto Mine Groundwater Monitoring Plan Version 2011-01* provides for baseline monitoring of hydrogeological conditions in areas where future mine components are being proposed including the Minto North Pit, Ridgetop North Pit and Ridgetop South Pit.

The Groundwater Monitoring Program is comprised of operational and baseline monitoring. Samples for the program are collected according to standard procedures such as those summarized in the ASTM (2007) *Standard Guide for Sampling Ground-Water Monitoring Wells*.

The main components of the *Minto Mine Groundwater Monitoring Plan Version 2011-01* presented in this section include the results for data collected with regards to groundwater quality, vibrating wire piezometers, and ground temperature cables.

5.11.1 Groundwater Wells

The *Minto Mine Groundwater Monitoring Plan Version 2011-01* describes a variety of groundwater wells at the Minto Mine, including operative, inoperative and proposed wells. There has been 31 groundwater wells installed at the Minto Mine and 18 of these wells are reported as operational for 2012. New groundwater well installations for 2012 included MW12-05, MW12-06, MW12-07, MW12-DP1, MW12-DP2, MW12-DP3 and MW12-DP4.

Table 5-32 lists the operational status and location of the groundwater wells at the Minto Mine.

Table 5-32 : 2012 Minto Mine groundwater wells operational status summary.

2012 Minto Mine Groundwater Wells Operational Status Summary		
Groundwater Well Name	**Location**	**Status**
W17	Main Water Dam area	Operational
MW12-06	Downstream of MCDS	Operational
P94-20	Main Water Dam area	Destroyed
MW09-01	Main Waste Dump area	Operational
MW09-03	Minto North Pit area	Operational
MW09-04	Area 1 Pit	Destroyed
P93-E	Area 1 Pit	Destroyed
MW12-07	Area 1 Pit	Operational
MW09-02	DSTSF area	Destroyed
W8	DSTSF area	Operational
W8A	DSTSF area	Operational
Unnamed auxiliary well near mill	Mill area	Operational
Unnamed camp water well	Camp area	Operational
08SWC270	Southwest Dump area	To be verified
08SWC271	Southwest Dump area	Destroyed
08SWC272	Southwest Dump area	Destroyed
08SWC273	Southwest Dump area	To be verified
08SWC274	Southwest Dump area	Destroyed
08SWC275	Southwest Dump area	Destroyed
08SWC277	Southwest Dump area	Destroyed
08SWC278	Southwest Dump area	Destroyed
08SWC280	Southwest Dump area	Destroyed
MW12-DP1	Southwest Dump area	Operational
MW12-DP2	Southwest Dump area	Operational
MW12-DP3	Southwest Dump area	Operational
MW11-01	Mill Water Pond area	Hole abandoned
MW11-01A	Mill Water Pond area	Operational
MW11-02	Ridgetop North area	Operational
MW11-03	Ridgetop North area	Operational
MW11-04	Ridgetop South area	Hole abandoned

2012 Minto Mine Groundwater Wells Operational Status Summary		
Groundwater Well Name	**Location**	**Status**
MW11-04A	Ridgetop South area	Operational
MW12-05	Near water quality station W3	Operational
MW12-DP4	MCDS area	Operational

Groundwater wells monitored in 2012 included W17, W8, W8A, MW09-01, MW09-03, MW11-04A, MW12-05, MW12-06, and MW12-07. Monitoring of W17, W8 and W8A is accomplished through the Water Quality Surveillance Program and Seepage Monitoring Programs. The monitoring results for W17 and results for W8 and W8A are presented in Section 5.4. Partial results for groundwater wells MW09-03, MW11-04A, MW12-05, MW12-06, and MW12-07 are presented in Table 5-33 through Table 5-37. Parameters presented include dissolved cadmium, copper, iron and selenium; ammonia; nitrite; and nitrate. Complete results as per the analytical suite described in the *Minto Mine Groundwater Monitoring Plan Version 2011-01* can be viewed in Appendix H.

MW09-01

Groundwater well MW09-01 was sampled in December 2012. MW09-01 did not produce any water and during the sampling effort and as a result no samples were collected.

MW09-03

Groundwater well MW09-03 has five zones that were sampled and produced results in 2012. Sampling of groundwater well MW09-03 occurred twice during 2012 (May and November).

Table 5-33 : 2012 groundwater well MW09-03 results.

2012 Groundwater Well MW09-03 Results								
Zone	**Date**	**Parameter**						
		Cadmium (D*) mg/L**	**Copper (D) mg/L**	**Iron (D) mg/L**	**Selenium (D) mg/L**	**Ammonia mg/L**	**Nitrite mg/L**	**Nitrate mg/L**
MW09-03-01	10/05/2012	0.000085	0.00281	<0.0050	<0.00010	0.073	0.182	0.109
MW09-03-01	17/11/2012	0.000683	0.00182	0.0116	0.000052	0.12	0.118	0.069
MW09-03-02	10/05/2012	0.000028	0.00107	19.2	0.0002	0.23	0.171	0.1
MW09-03-02	17/11/2012	<0.000025	0.00073	19.4	<0.00020	0.23	0.0924	0.035
MW09-03-03	10/05/2012	0.000069	0.0032	0.0164	0.00031	<0.0050	0.0145	0.302
MW09-03-03	17/11/2012	0.000023	0.00174	0.0113	0.000414	0.0054	0.0058	0.248
MW09-03-04	17/11/2012	0.000015	0.00205	0.008	0.000301	0.027	<0.0050	0.248
MW09-03-05	10/05/2012	<0.000010	0.00022	<0.0050	<0.00010	0.0069	<0.0050	<0.020
MW09-03-05	17/11/2012	<0.0000050	0.000107	0.0016	<0.000040	<0.0050	<0.0050	<0.020

*D=Dissolved
**mg/L=milligrams/litre

MW11-04A

Groundwater well MW11-04A was sampled and produced results in 2012. Sampling of groundwater well MW11-04A occurred once in May 2012.

Table 5-34 : 2012 groundwater well MW11-04A results.

2012 Groundwater Well MW11-04A Results								
Zone	Date	Parameter						
		Cadmium (D*) mg/L**	Copper (D) mg/L	Iron (D) mg/L	Selenium (D) mg/L	Ammonia mg/L	Nitrite mg/L	Nitrate mg/L
MW11-04A	18/05/2012	0.000015	0.0932	0.0161	0.00334	1.5	0.0234	1.6

*D=Dissolved
**mg/L=milligrams/litre

MW12-05

Groundwater well MW12-05 has four zones that were sampled and produced results in 2012. Sampling of groundwater well MW12-05 occurred in November 2012. Groundwater well MW12-05 was installed in 2012.

Table 5-35 : 2012 groundwater well MW12-05 results.

2012 Groundwater Well MW12-05 Results								
Zone	Date	Parameter						
		Cadmium (D*) mg/L**	Copper (D) mg/L	Iron (D) mg/L	Selenium (D) mg/L	Ammonia mg/L	Nitrite mg/L	Nitrate mg/L
MW12-05-01	11/11/2012	0.00014	0.00737	0.0085	0.00047	<0.0050	0.0517	0.368
MW12-05-03	12/11/2012	0.000324	0.00266	0.15	0.000345	0.015	0.0936	0.068
MW12-05-03	12/11/2012	0.000214	0.0022	0.0981	0.000364	0.019	0.109	0.03
MW12-05-05	12/11/2012	0.000016	0.00154	0.0152	0.000164	0.016	0.195	0.817
MW12-05-07	12/11/2012	<0.0000050	0.000477	0.867	0.000108	0.21	0.0298	<0.020

*D=Dissolved
**mg/L=milligrams/litre

MW12-06

Groundwater well MW12-06 has three zones that were sampled and produced results in 2012. Sampling of groundwater well MW12-06 occurred in November 2012. Groundwater well MW12-06 was installed in 2012.

Table 5-36 : 2012 groundwater well MW12-06 results.

2012 Groundwater Well MW12-06 Results								
Zone	Date	Parameter						
		Cadmium (D*) mg/L**	Copper (D) mg/L	Iron (D) mg/L	Selenium (D) mg/L	Ammonia mg/L	Nitrite mg/L	Nitrate mg/L
MW12-06-02	16/11/2012	0.000016	0.000231	0.736	0.00014	0.0096	0.215	0.066
MW12-06-02	16/11/2012	0.000047	0.00115	0.726	0.000238	0.0074	0.263	0.081
MW12-06-04	16/11/2012	0.000012	0.000106	0.717	0.000083	0.0059	0.229	0.08
MW12-06-06	16/11/2012	0.000012	0.000261	0.0833	0.000511	0.085	0.0651	0.45

*D=Dissolved
**mg/L=milligrams/litre

MW12-07

Groundwater well MW12-07 has two zones that were sampled and produced results in 2012. Sampling of groundwater well MW12-07 occurred in November 2012. Groundwater well MW12-07 was installed in 2012.

Table 5-37 : 2012 groundwater well MW12-07 results.

2012 Groundwater Well MW12-07 Results								
Zone	Date	Parameter						
		Cadmium (D*) mg/L**	Copper (D) mg/L	Iron (D) mg/L	Selenium (D) mg/L	Ammonia mg/L	Nitrite mg/L	Nitrate mg/L
MW12-07-01	03/11/2012	0.000224	0.077	0.23	0.0337	<0.0050	0.0731	53.2
MW12-07-01	03/11/2012	0.000633	0.0767	0.189	0.0347	0.012	0.141	53.5
MW12-07-02	03/11/2012	0.000269	0.0217	0.0069	0.0148	<0.0050	0.148	21.3

*D=Dissolved
**mg/L=milligrams/litre

5.11.2 Vibrating Wire Piezometers

The *Minto Mine Groundwater Monitoring Plan Version 2011-01* describes 11 vibrating wire piezometers at the Minto Mine as being operative. In total, records indicated that 18 vibrating wire piezometers have been installed at the Minto Mine in the locations of the DSTSF and Southwest Dump. Of the 18 installed piezometers 8 have been destroyed, 6 are operational, 3 are inoperative and 1 piezometer requires verification. The eight destroyed piezometers were destroyed prior to 2012 and have been previously reported as “destroyed” in the *2011 Annual Water Licence Report*. There were no new piezometer installations at the Minto Mine in 2012.

In 2012, the piezometers DSP-3A, DSP-4A and DSP-4B located at the DSTSF were found to be inoperative.

All operational piezometers are located in the vicinity of the Southwest Dump. Table 5-38 summarizes the operational status of the piezometers at the Minto Mine.

Table 5-38 : 2012 Minto Mine vibrating wire piezometer operational status summary.

2012 Minto Mine Vibrating Wire Piezometer Summary		
Vibrating Wire Piezometer	**Location**	**Operational Status**
DSP-1A	DSTSF Area	Destroyed (2011)
DSP-1B	DSTSF Area	Destroyed (2011)
DSP-2A	DSTSF Area	Destroyed (2011)
DSP-2B	DSTSF Area	Destroyed (2011)
DSP-3A	DSTSF Area	Inoperative
DSP-3B	DSTSF Area	Destroyed (2011)
DSP-4A	DSTSF Area	Inoperative
DSP-4B	DSTSF Area	Inoperative
DSP-5	DSTSF Area	Destroyed (2011)
DSP-6	DSTSF Area	Destroyed (2011)
DSP-7	DSTSF Area	Destroyed (2011)
SDP-1	Southwest Dump Area	To be verified
SDP-2A	Southwest Dump Area	Operational
SDP-2B	Southwest Dump Area	Operational
SDP-3A	Southwest Dump Area	Operational
SDP-3B	Southwest Dump Area	Operational
SDP-4A	Southwest Dump Area	Operational
SDP-4B	Southwest Dump Area	Operational

DSTSF Piezometers

A single piezometer reading was obtained in February 2012 at DSTSF piezometer DSP-3A. All other piezometers at the DSTSF have been destroyed or are inoperative. On February 28, 2012 DSP-3A indicated an elevation of 763.89m.

Southwest Dump Piezometers

The Southwest Dump piezometers SDP-2A, SDP-2B, SDP-3A, SDP-3B, SDP-4A and SDP-4B were operational in 2012. The Southwest Dump piezometer data were collected in February through to November 2012; January 2012 was not collected as a result of operational error and December 2012 was not collected as a result of a damaged piezometer reader. The Southwest Dump piezometer results are presented in Figure 5-66**.** The Southwest Dump piezometers recorded a similar trend throughout 2012 as exhibited in Figure 5-66. Between February and November 2012, the trend for all piezometers at the Southwest Dump included a decline, stabilization, rise and stabilization.

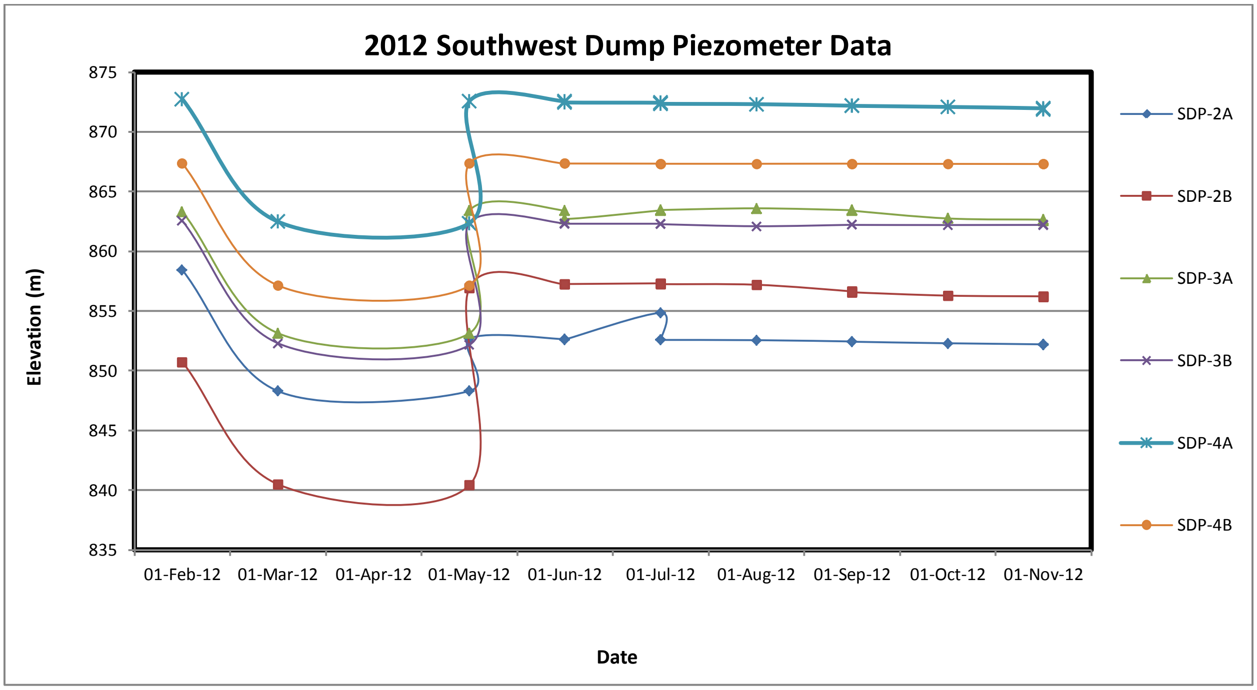

Figure 5-66 : 2012 Southwest Dump piezometer data.

5.11.3 Ground Temperature Cables

The *Minto Mine Groundwater Monitoring Plan Version 2011-01* describes 19 ground temperature cables at the Minto Mine, including both operative and inoperative ground temperature cables. In total, 27 ground temperature cables have been installed at the Minto Mine; 13 of the installed ground temperature cables were operational in 2012. All operational ground temperature cables in 2011 remained operational in 2012 and there were no cables found to be damaged or destroyed in 2012. Of the 27 installed ground temperature cables at the Minto Mine, 14 ground temperature cables were destroyed in 2011 or earlier.

New ground temperature cable installations for 2012 included DST-12, located at the DSTSF.

Operational ground temperature cables are located at the DSTSF area (3 cables), Mill Water Pond area (3 cables), Southwest Dump (4 cables) and the Ridgetop area (3 cables). Table 5-39 lists the operational status and location of the ground temperature cables at the Minto Mine.

Table 5-39 : 2012 Minto Mine ground temperature cable operational status summary.

2012 Minto Mine Ground Temperature Cable Operational Status Summary		
Ground Temperature Cable	**Location**	**Status**
DST-1	DSTSF area	Destroyed (2011)
DST-2	DSTSF area	Destroyed (2011)
DST-3	DSTSF area	Operational

2012 Minto Mine Ground Temperature Cable Operational Status Summary		
Ground Temperature Cable	**Location**	**Status**
DST-4	DSTSF area	Operational
DST-5	DSTSF area	Destroyed (2011)
DST-6	DSTSF area	Destroyed (2011)
DST-7	DSTSF area	Destroyed (2010)
DST-8	DSTSF area	Destroyed (2011)
DST-9	DSTSF area	Destroyed (2011)
96-G08	DSTSF area	Destroyed (2009)
DST-12	DSTSF area	Operational
MWPT-1	Mill Water Pond area	Operational
MWPT-2	Mill Water Pond area	Operational
MW11-01	Mill Water Pond area	Could not install (hole abandoned)
MW11-01A	Mill Water Pond area	Operational
SDT-1	Southwest Dump	Operational
SDT-2	Southwest Dump	Operational
SDT-3	Southwest Dump	Operational
SDT-4	Southwest Dump	Operational
08SWC271	Southwest Dump	Destroyed (2010)
08SWC274	Southwest Dump	Destroyed (2011)
08SWC275	Southwest Dump	Destroyed (2008)
08SWC277	Southwest Dump	Destroyed (2008)
08SWC278	Southwest Dump	Destroyed (2008)
08SWC280	Southwest Dump	Destroyed (2008)
MW11-02	Ridgetop North Area	Operational
MW11-03	Ridgetop North Area	Operational
MW11-04	Ridgetop South Area	Could not install (hole abandoned)
MW11-04A	Ridgetop South Area	Operational

DSTSF Area Ground Temperature Cables

Ground temperature cables DST-3, DST-4 and DST-12 are installed at the DSTSF. Data was obtained in February, March and April 2012 for DST-3 and DST-4. Data for DST-12 was obtained during March and April 2012. Further data in 2012 was not obtained as the ground temperature cable reader was inoperative.

Figure 5-67 through Figure 5-69 display the 2012 data collected from ground temperature cables DST-3, DST-4 and DST-12. Figure 5-67 displays ground temperatures at DST-3 remained below 0°C at all elevations from February through April 2012.

Ground temperature cable DST-4 (Figure 5-68) displayed ground temperatures below 0°C at elevations below 763 m from February through April 2012. Above 763 m, ground temperatures during February and March 2012 fluctuated at or above 0°C for 2 m; above 770 m ground temperatures remained below 0°C for February and March 2012. In April 2012, DST-4 recorded a ground temperature of 6.1°C in the top 2 m of ground.

Ground temperature readings for DST-12 (Figure 5-69) predominately show ground temperatures at or below 0°C between the elevations of 748 m (ground level) and 732 m (bedrock level).

Mill Water Pond Area Ground Temperature Cables

Ground temperature cables MWPT-1, MWPT-2 and MW11-01A are installed in the Mill Water Pond area. Data was obtained in January, February and March 2012 for MW11-01A and in February and March 2012 for MWPT-1 and MWPT-2. Further data in 2012 was not obtained as the ground temperature cable reader was inoperative.

Figure 5-70 through Figure 5-72 display the 2012 data collected from ground temperature cables MWPT-1, MWPT-2 and MW11-01A. Figure 5-70 and Figure 5-71 display ground temperatures at both MWPT-1 and MWPT-2 remaining below 0°C at all elevations during February and March 2012.

During January to March 2012, ground temperature cable MW11-01A (Figure 5-72) exhibited temperatures below 0°C from ground level to 780 m (approximately 2m). Below 781 m, MW11-01A fluctuated between -0.15°C and 0.50°C for approximately 40 m. Below 740 m, MW11-01A exhibited temperatures above 0°C.

Southwest Dump Ground Temperature Cables

Ground temperature cables SDT-1, SDT-2, SDT-3 and SDT-4 are installed in the Southwest Dump area. Data was obtained in February, March, May and June 2012 for all the ground temperature cables in the Southwest Dump area. Further data in 2012 was not obtained as the ground temperature cable reader was inoperative.

Figure 5-73 through Figure 5-76 display the 2012 data collected from ground temperature cables SDT-1, SDT-2, SDT-3 and SDT-4. Figure 5-73 displays ground temperatures at SDT-1 remaining below 0°C at all elevations during February through June 2012.

Ground temperature cable SDT-2 (Figure 5-74) measured ground temperatures above 0°C between 847 m (ground level) and 845 m in May and June 2012 (approximately 2m); SDT-2 displayed temperatures less than 0°C at elevations below 845 m between February through June 2012.

Ground temperature cable SDT-3 is shown in Figure 5-75. Between 858 m and 854 m, SDT-3 measured approximately 4 m of ground with temperatures above 0°C during May and June 2012. Ground temperatures at SDT-3 at elevations below 854 m had temperatures below 0°C between February and June 2012.

Between February and June 2012, the active layer in SDT-4 was approximately 3 m (Figure 5-76). SDT-4 recorded temperatures warmer than 0°C above 860 m during the months March, May and June 2012. Ground temperatures at SDT-4 remained below 0°C at all elevations below 859m during February, March, May and June 2012.

Ridgetop North and South Area Ground Temperature Cables

Three ground temperature cables are located in the Ridgetop area: MW11-02 and MW11-03 are installed in the Ridgetop North area; and MW11-04A is installed in the Ridgetop South area. Data was obtained in January, February and March 2012 for MW11-2 and MW11-03 and in February and March 2012 for MW11-04A. Further data in 2012 was not obtained as the ground temperature cable reader was inoperative.

Figure 5-77 through Figure 5-79 display the 2012 data collected from ground temperature cables MW11-02, MW11-03 and MW11-04A. Figure 5-77 displays ground temperatures at MW11-02 remaining below 0°C at all elevations during January to March 2012. Similarly, MW11-03 recorded ground temperatures at or below 0°C at all elevations between January to March 2012 (Figure 5-78).

Ground temperature cable MW11-04A recorded ground temperatures predominately above 0°C; 2m of ground immediately below ground level was below 0°C in February and March 2012 (Figure 5-79).

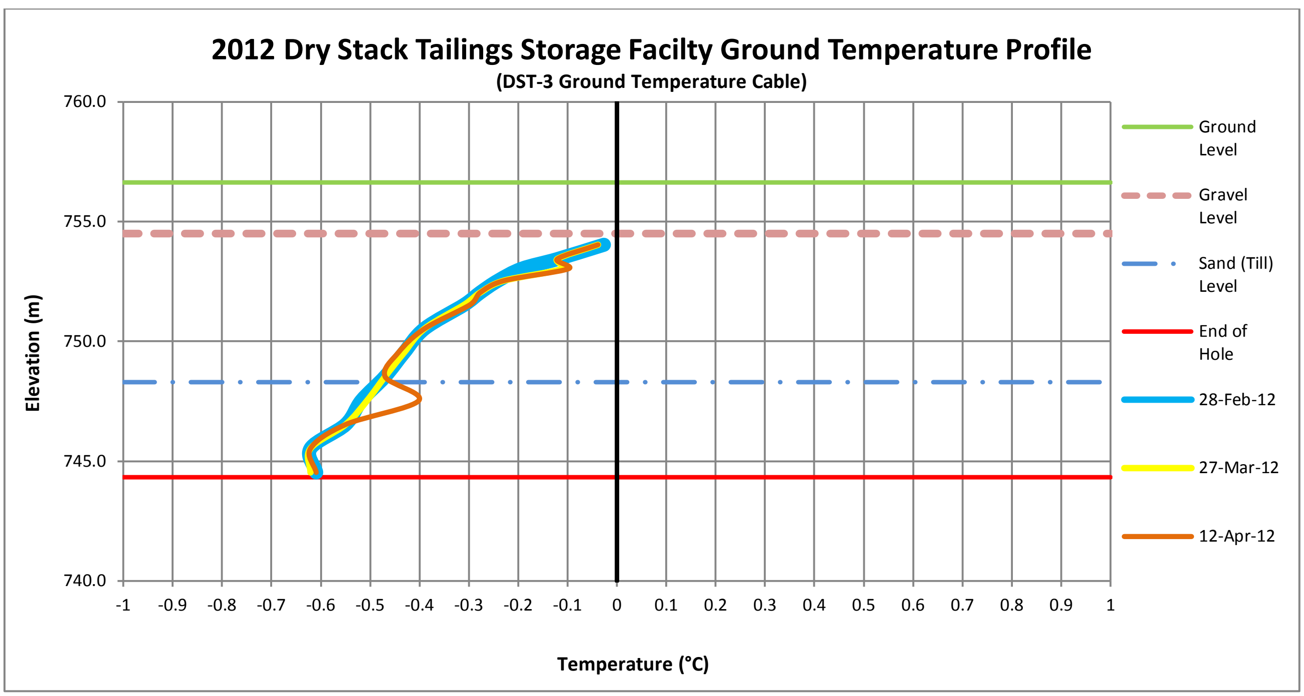

Figure 5-67 : 2012 Dry Stack Tailings Storage Facility ground temperature profile (DST-3 Ground Temperature Cable).

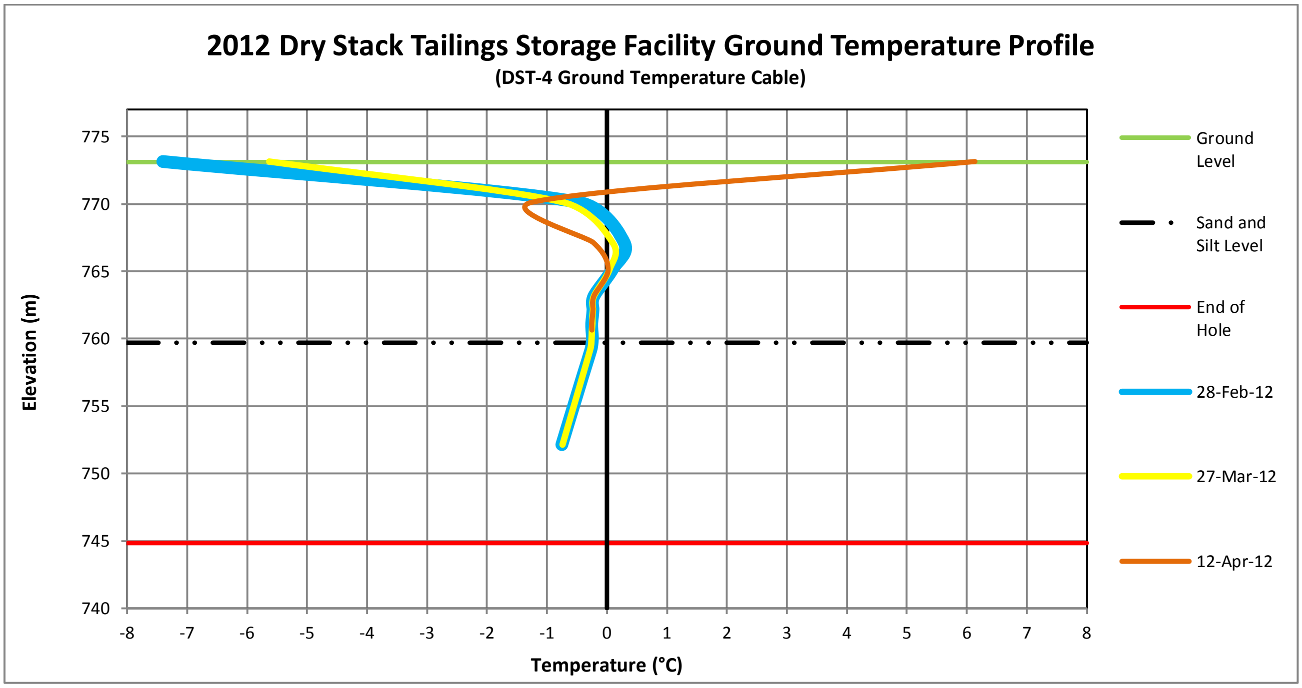

Figure 5-68 : 2012 Dry Stack Tailings Storage Facility ground temperature profile (DST-4 Ground Temperature Cable).

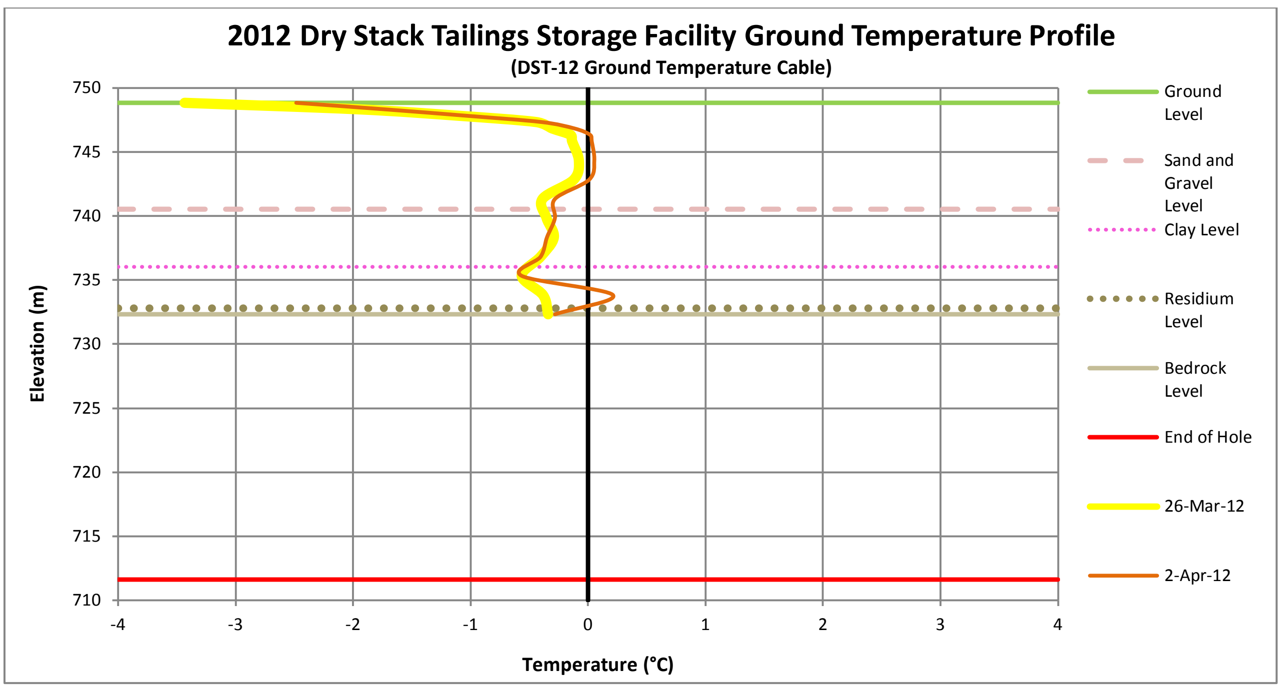

Figure 5-69 : 2012 Dry Stack Tailings Storage Facility Ground Temperature Profile (DST-12 Ground Temperature Cable).

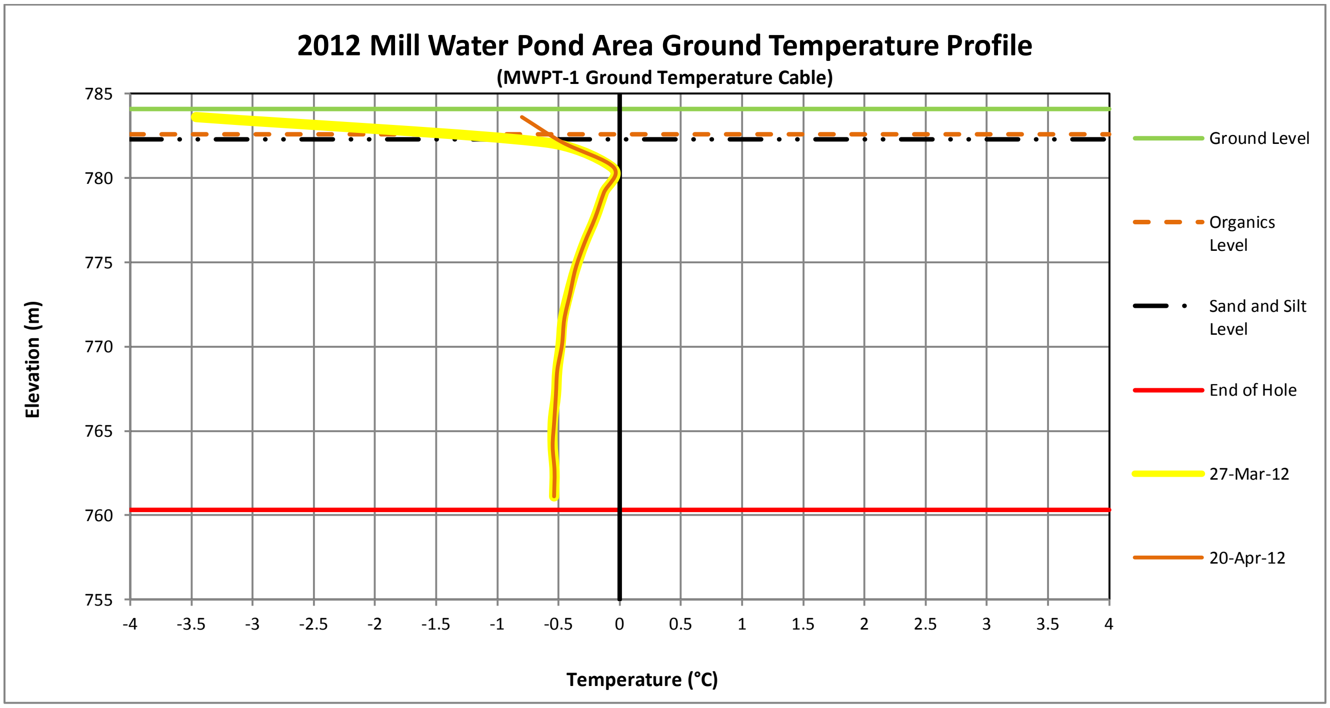

Figure 5-70 : 2012 Mill Water Pond area ground temperature profile (MWPT-1 Ground Temperature Cable).

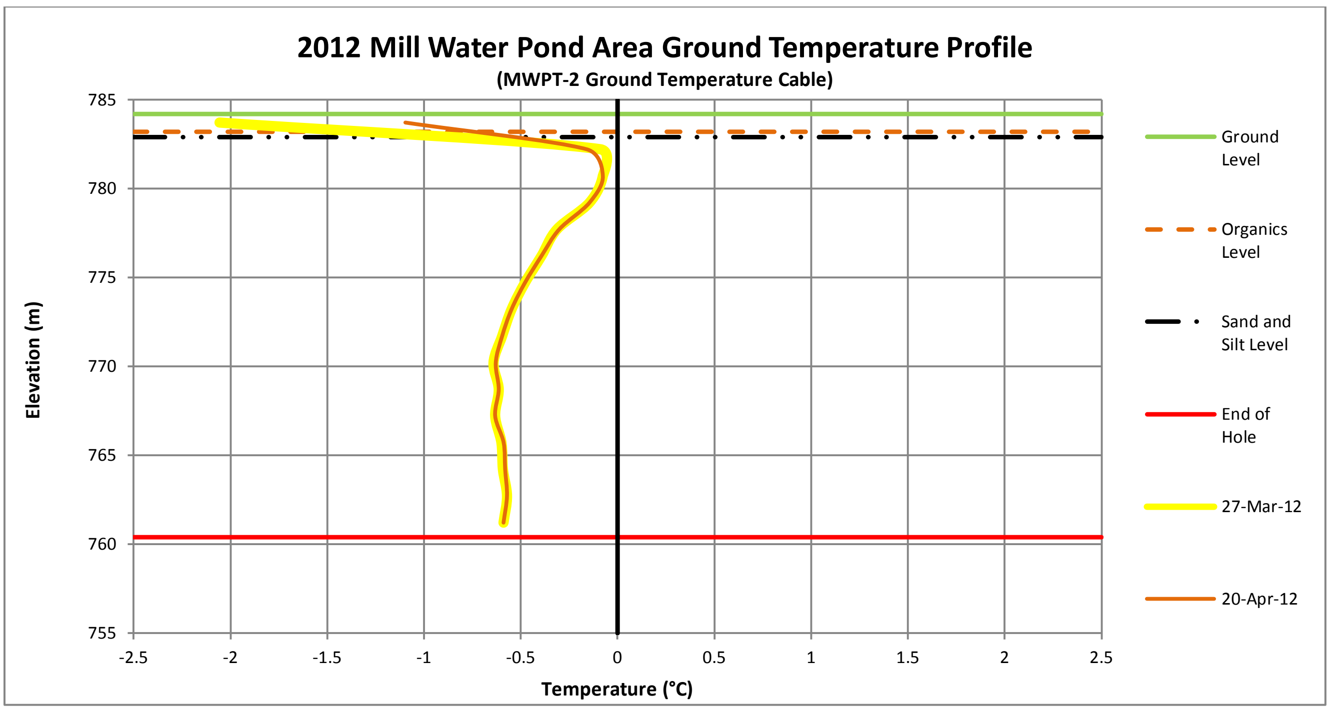

Figure 5-71 : 2012 Mill Water Pond area ground temperature profile (MWPT-2 Ground Temperature Cable).

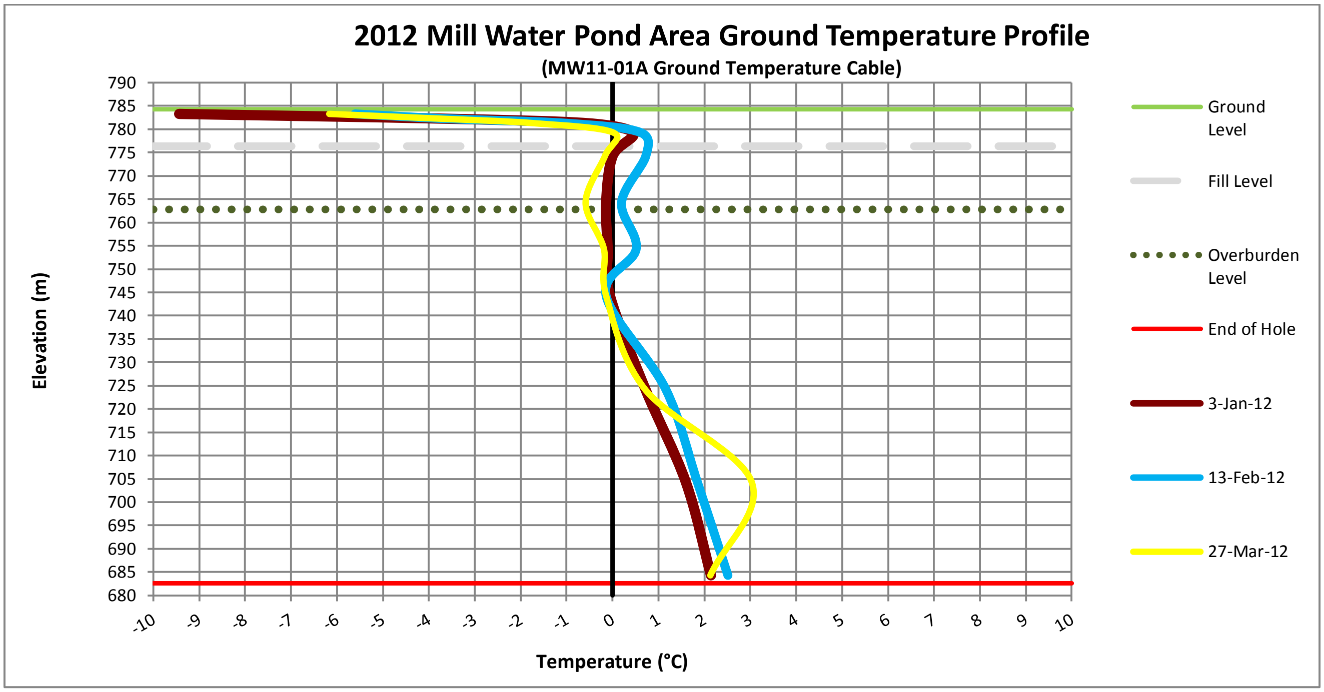

Figure 5-72 : 2012 Mill Water Pond area ground temperature profile (MW11-01A Ground Temperature Cable).

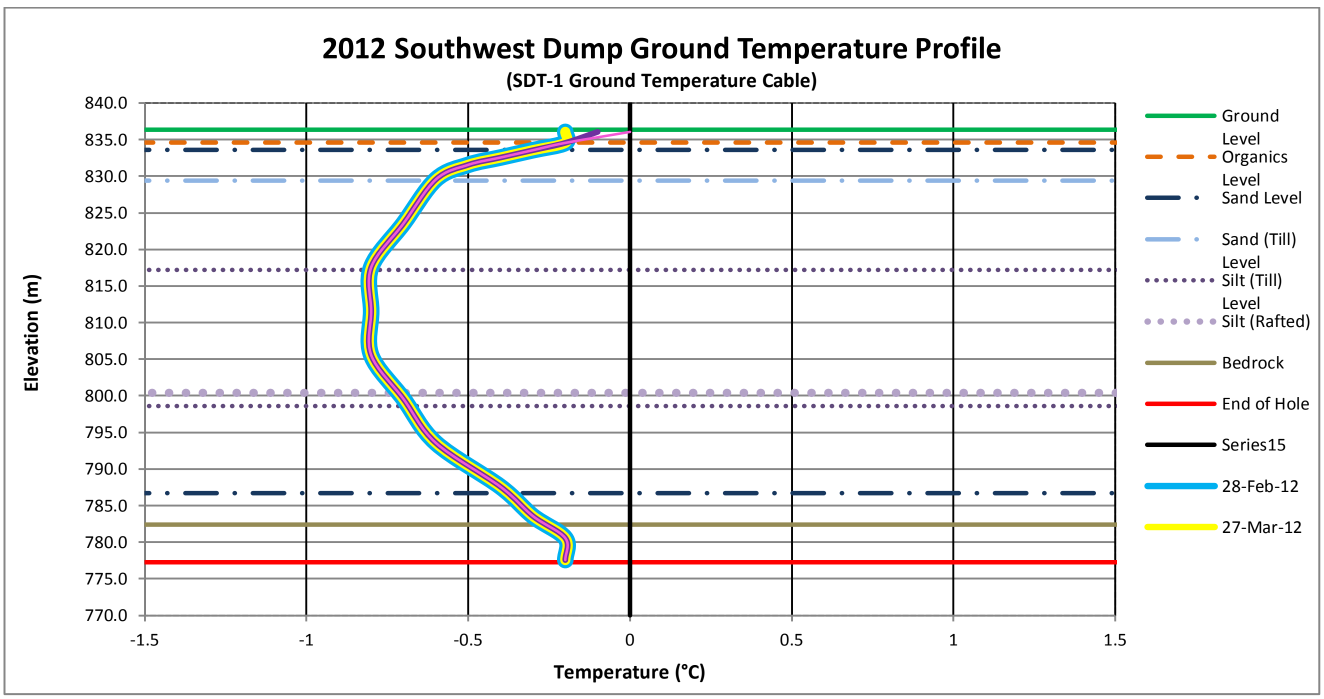

Figure 5-73 : 2012 Southwest Dump ground temperature profile (SDT-1 Ground Temperature Cable).

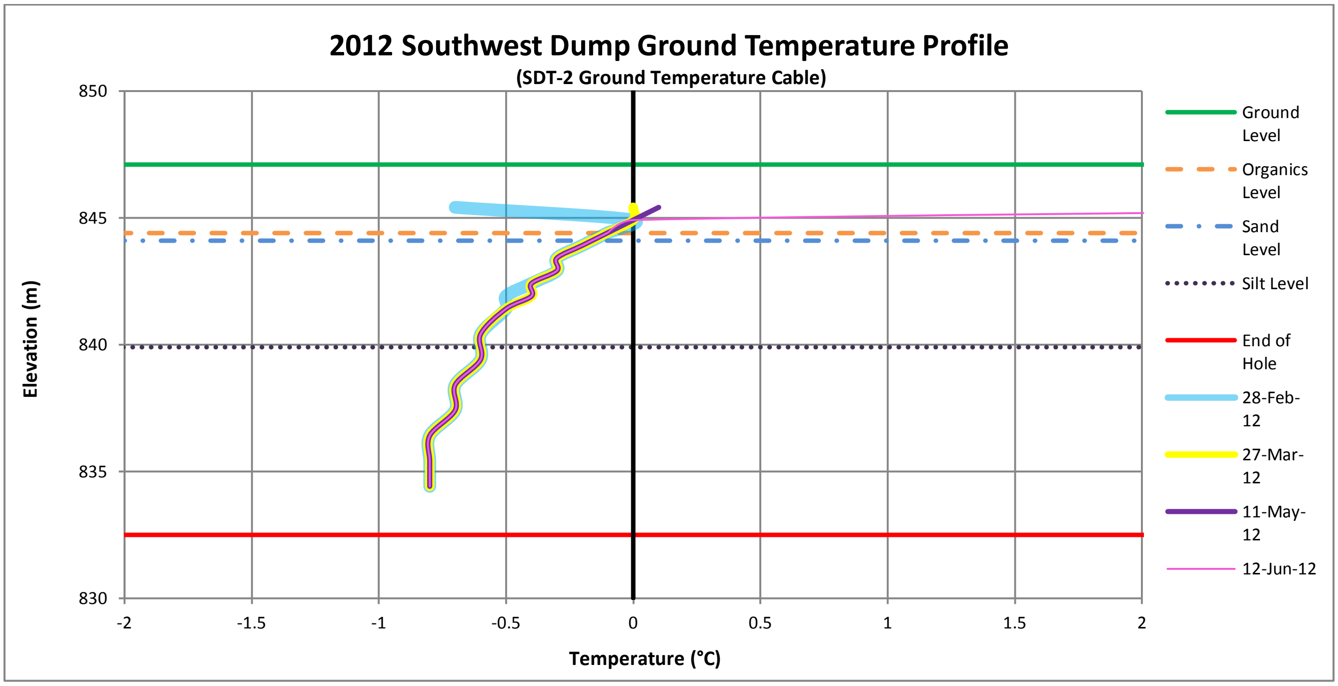

Figure 5-74 : 2012 Southwest Dump ground temperature profile (SDT-2 Ground Temperature Cable).

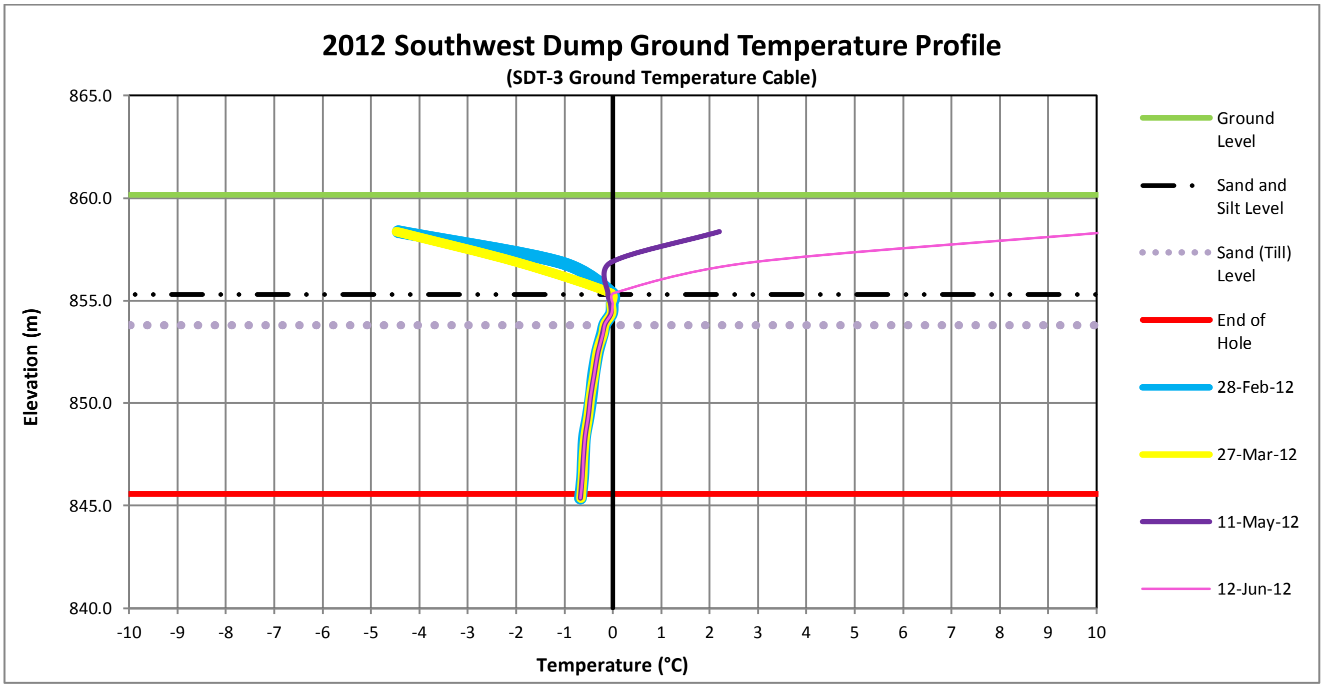

Figure 5-75 : 2012 Southwest Dump ground temperature profile (SDT-3 Ground Temperature Cable).

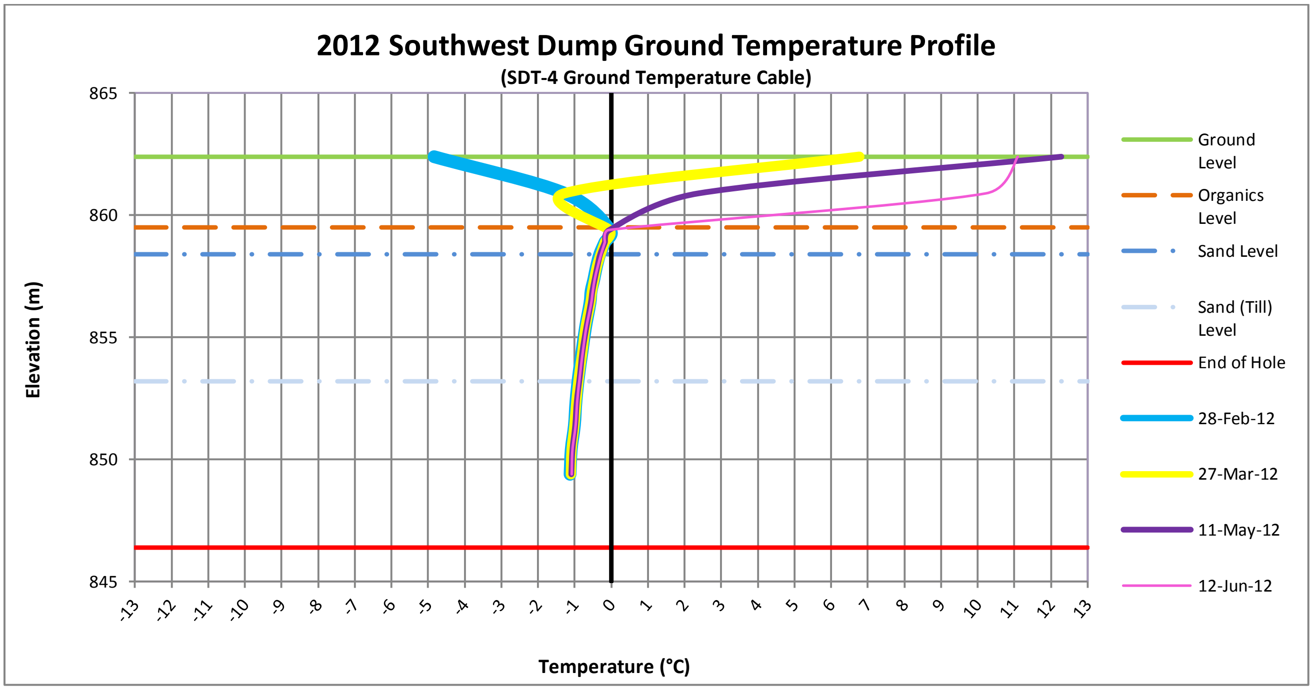

Figure 5-76 : 2012 Southwest Dump ground temperature profile (SDT-4 Ground Temperature Cable).

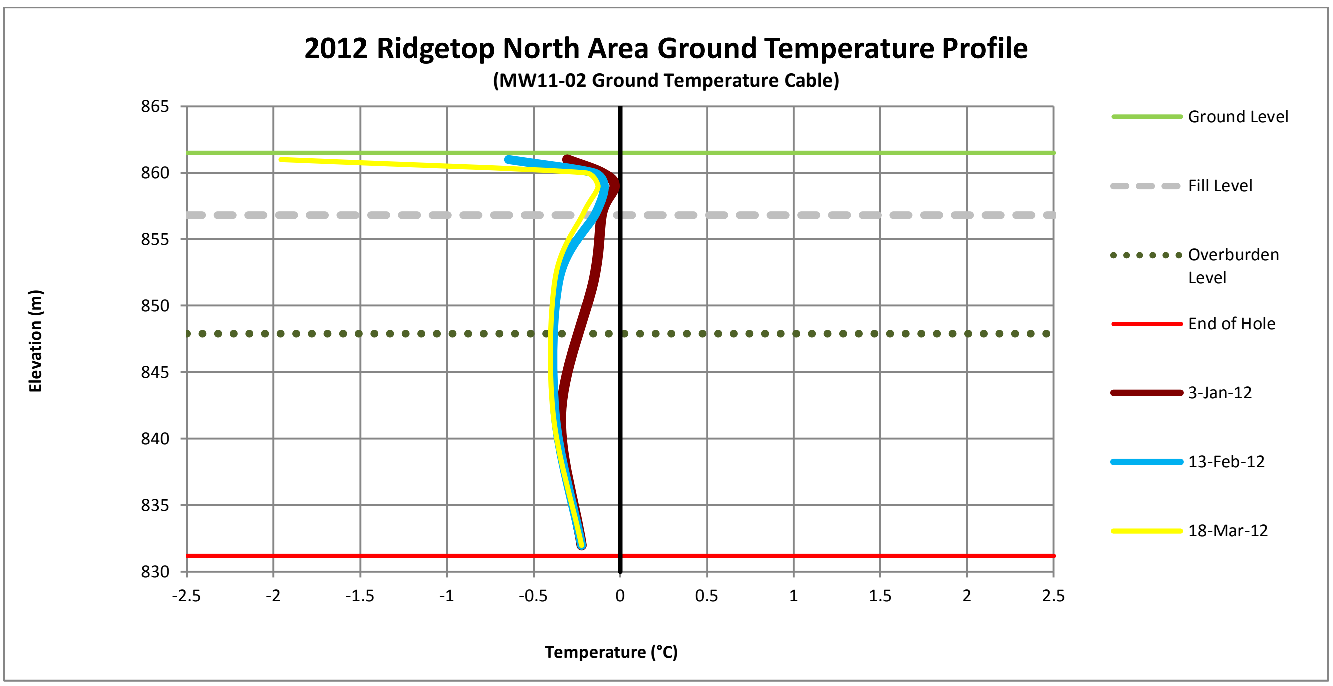

Figure 5-77 : 2012 Ridgetop North area ground temperature profile (MW11-02 Ground Temperature Cable).

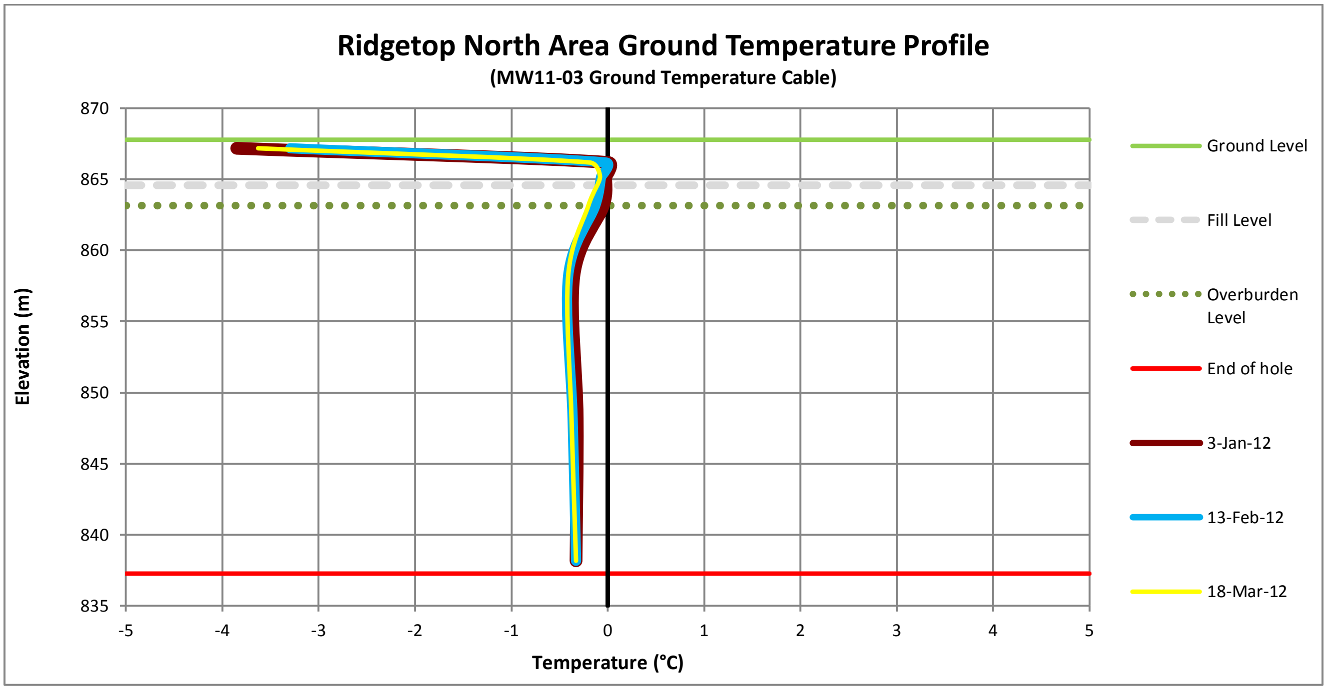

Figure 5-78 : 2012 Ridgetop North area ground temperature profile (MW11-03 Ground Temperature Cable).

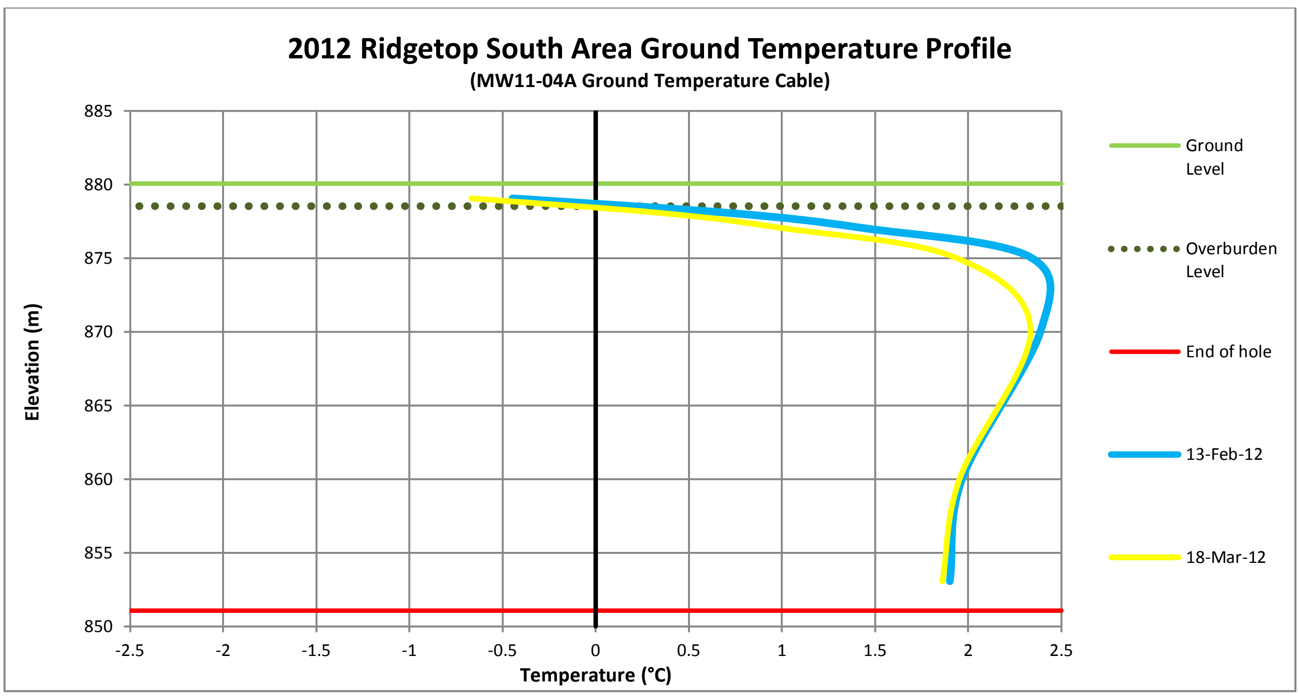

Figure 5-79 : 2012 Ridgetop South area ground temperature profile (MW11-04A Ground Temperature Cable).

5.12 Waste Rock Verification Program

In 2012, Minto Mine encountered significant amount of waste rock that had a Neutralization Potential Ratio (NPR) of less than 3. At that time, timely evaluation of the waste rock NPR could not be achieved through external laboratory analysis and the Minto Mine response was to establish an on-site laboratory. Prompt results were necessary in order to prevent production delays.

In August 2012 Minto Mine setup an on-site carbon sulphur analysis laboratory that was able to analyze waste rock and report results within 24 hours. The carbon sulphur laboratory analysis consisted of testing every blast hole sample using a CS-800 Eltra furnace. The results where then converted to NPR and the mine operations department were able to use that data to dispatch waste to the appropriate waste facilities.

After the carbon sulphur analysis laboratory was commissioned, the waste rock at Minto Mine was broken down by grade bins and NPR. As mentioned Section 2.2.1, after August 17 all waste that was determined to have a NPR under 3 was dispatched to Main Pit Buttress below the high water mark. Waste rock that was above a NPR of 3 was dispatched according to the procedures described in the *Waste Rock and Overburden Management Plan*.

5.13 Wildlife Protection Program

Wildlife protection was strengthened in 2012. Considerable effort was invested in improving Minto Mine's waste management on-site, with improved segregation and storage of waste streams which minimized the amount of food and food-contaminated waste around the Minto Mine. This, along with frequently reiterated messages to staff regarding animal attractants and habituated wildlife – through staff orientations, toolbox discussions and safety briefings – has resulted in a marked reduction in wildlife disturbance and human/wildlife interaction during the year. No wildlife were destroyed and only non-lethal hazing techniques were applied (i.e., banger, screamers and air horns).

Wildlife Control Officers were hired for the first time in 2012, for the spring through fall period, and the positions will be retained for 2013. Wildlife sighting logs were distributed throughout the Minto Mine for 2012 and personnel were able to record wildlife on an as-observed basis. Wildlife Officers reinforced the collection of data in regards to wildlife use of the Minto Mine with daily dedicated wildlife observations. The overall aim of the monitoring effort is to establish information over time of concerning wildlife's use of habitat areas and corridors at the Minto Mine.

6 Acid-Base Accounting Program

Appendix 6 of the WUL requires submission of the results of the Acid-Base Accounting program (ABA program) that was conducted during the reporting year. The ABA program determines the NPR (defined as Neutralizing Potential divided by Acid Potential [NP/AP]) for overburden and waste rock to confirm that the NPR is greater than 3. An NPR value of 3 or greater is generally considered to indicate non-acid generating material. A separate, parallel program was initiated to determine the NPR of the tailings solids.

The following is a summary of results from the ABA program for the reporting period January to December 2012 (results pending from October 2, 2012 to end of year). The second 2012 bi-annual report can be viewed in Appendix I.

A total of 379 samples were collected and sent to the accredited laboratory (SGS CEMI Ltd.) during the 2012 reporting period. Of the 379 samples, 261 results were received with the remaining 118 samples pending results. The samples were analyzed according to the BC Research Standard Method as required by the WUL. The mean NPR results for the duration of the reporting period for waste rock samples was 24.78.

64 samples during the 2012 reporting period were below the NPR threshold of 3. Paste pH values were all above the required threshold of 5 with a mean value of 8.7 for. The mean sulphide sulphur content for waste rock samples during the 2012 reporting period was 0.32%. In 2012, 67 samples were above the sulphide sulphur content for construction grade waste.

Tailings samples analyzed in this period had a mean NPR of 15.8. All tailings samples were within the required limits (NPR >4). All 9 samples (1 pending results) of tailings were also compliant in Paste pH and sulphide sulphur content.

In August 2012, Minto Mine implemented a new waste rock dispatching system to account for the increase in waste rock not meeting the NPR threshold of 3. To aid in the dispatching of waste rock Minto Mine purchased and setup an Eltra carbon-sulphur determinizer (Eltra) (see Section 5.12). The results received from the Eltra allowed for waste rock to be categorized by sulphur percentage as well as a calculated NPR, then allowing Minto Mine to dispatch waste to appropriate waste storage facilities.

7 Physical Monitoring Program

As a requirement of Clause 12.1 of the QML, Minto Mine has conducted the following inspection requirements:

- Structural inspections (daily inspections of the Main Waste Dump, Ice-Rich Overburden Dump, and the Oxide Waste Dump); and
- Visual inspections (daily inspection for the Main Waste Dump, Oxide Waste Dump, Ice-Rich Overburden Dump, Water Dam and Diversion Ditch; and weekly inspections of the Mill Water Pond).

7.1 Physical Deformation Programs

As a requirement of the WUL, Minto Mine submitted Deformation Monitoring programs for all Minto Mine waste structures. Key information from the Deformation Monitoring Programs is described in this section.

There are currently six major waste structures on-site:

1. Main Waste Dump
2. Ice-rich Overburden Dump
3. Reclamation Overburden Dump
4. Southwest Dump
5. Main Pit Buttress
6. Dry Stack Tailings Storage Facility

All of the waste structures at Minto Mine are monitored for movement through physical instrumentation monitoring. Table 7-1, presents the 2012 physical instrumentation monitoring frequencies.

Table 7-1: 2012 physical instrumentation monitoring frequency.

Instrument	Frequency
Monitoring of site survey hubs	Bi-weekly
Monitoring of prisms	Weekly for active mining, Bi-weekly for non-active
Monitoring of inclinometers	Monthly
Monitoring of ground temperature cables	Monthly
Monitoring of piezometers	Monthly

In 2012, monitoring of the DSTSF identified a decreased rate of movement when compared to 2011 data. Figure 7-1 displays the direction and movement rates near the end of 2012.

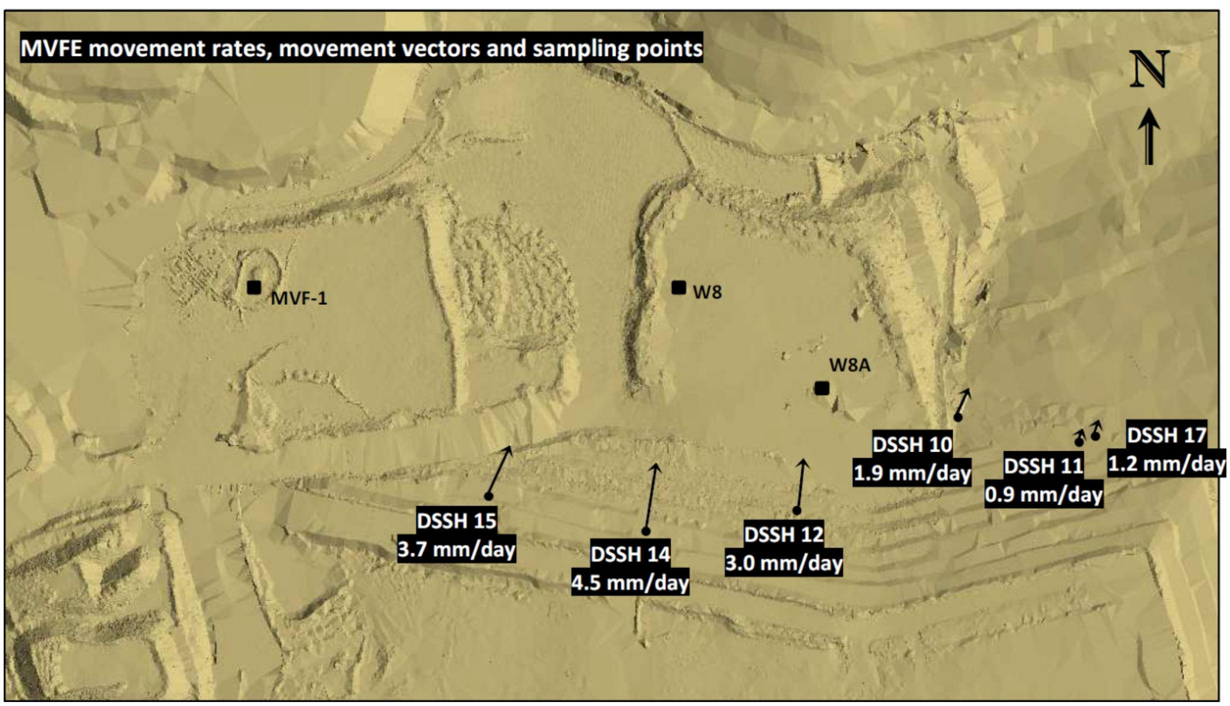

Figure 7-1: DSTSF movement rates November 10, 2012 (Adapted from the *Minto Mine Waste Structure Deformation Monitoring Plan and Report*).

Further details on DSTSF monitoring and associated results, can be found in the *Dry Stack Tailing Storage Facility Deformation Monitoring Plan Report* which was submitted to the Yukon Water Board on November 12, 2012.

A plot of the survey hub locations and movements vectors for the Main Pit Buttress and Southwest Dump are presented in Figure 7-2.

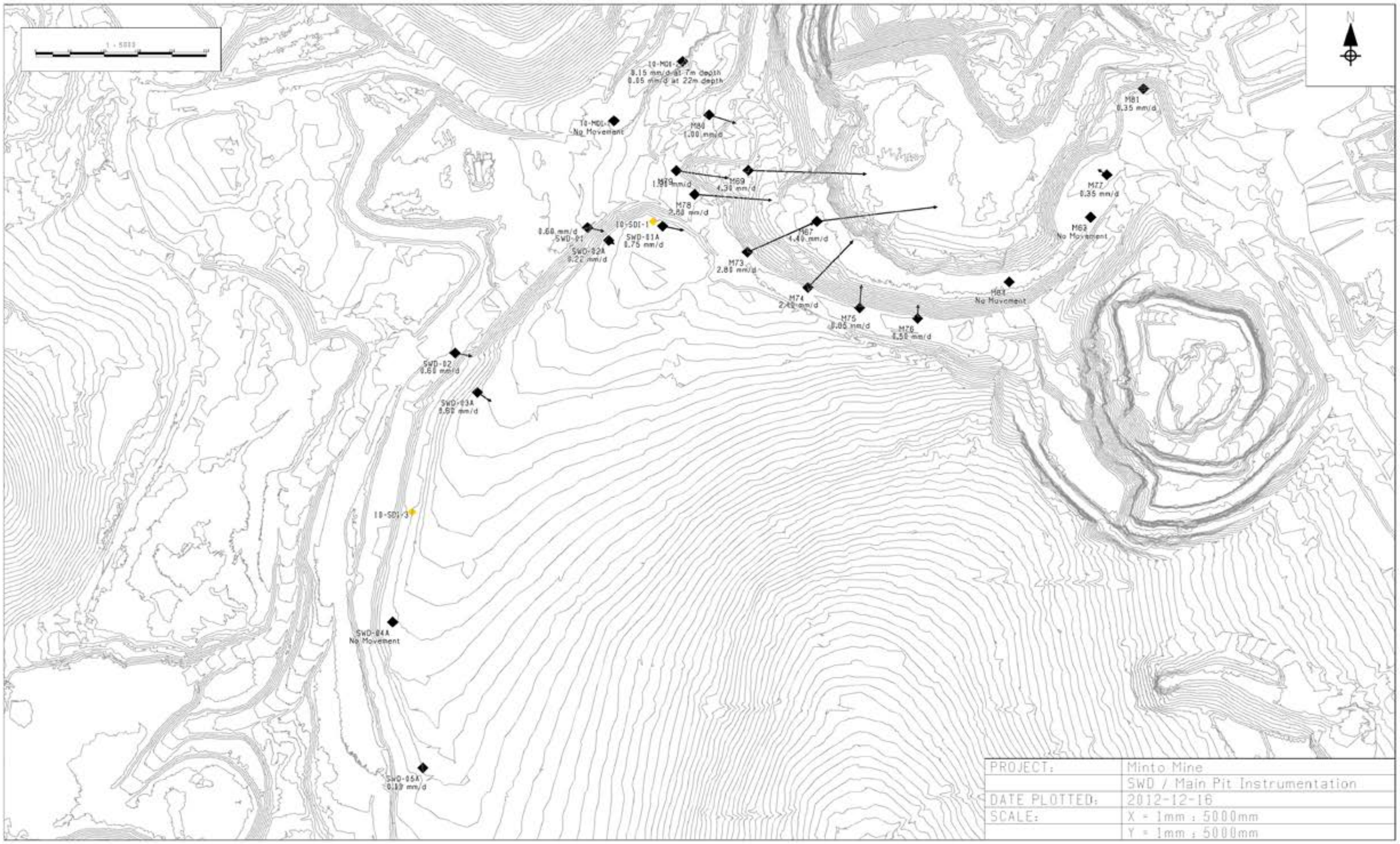

Figure 7-2: Southwest Dump and Main Pit Buttress survey hubs with movement vectors (Adapted from *Minto Waste Structure Deformation Monitoring Plan and Report*).

7.2 Engineer's Annual Physical Inspection Reports

As required by the WUL and QML, Minto Mine has had the following structures inspected by a qualified engineer licenced to practice in the Yukon:

- Big Creek Bridge
- Mill and Camp
- DSTSF
- Fuel Containment Facility
- Ice Rick Overburden Dump
- Main Waste Dump
- Mill Water Pond
- Ore Stockpiles
- Reclamation Overburden Dump
- South Diversion Ditch
- Southwest Dump
- Water Storage Pond Dam

The annual inspection report are intended to consider works undertaken throughout the reporting period and provide recommendations for the following year. The inspection was completed by a Professional Engineer licenced to practice in the Yukon, Peter Mikes of SRK Consulting's Vancouver office, during a mine site visit on September 29, 2012. Table 7-2 summarizes the engineer's recommendations and planned actions for rectifying deficiencies noted in the recommendations.

Table 7-2: Physical inspection recommendation summary table.

Area	Recommendation	Action required/Observations
Dry Stack Tailing Facility	A complete record of the field density tests from the DSTSF construction should be compiled and maintained on-site.	Contact EBA Consulting and archive field density testing records within Minto's Ground Control Program database Target Date: End Q2 2013
	Fill in small sinkhole in crest. Re-grade area to direct run-off away.	Complete as part of temporary Dry Stack Tailings cover installation Target Date: End Q2 2013
	Rehabilitate Tailings Diversion Ditch to capture & convey water along entire length. Reconstruct discharge ditch in line with for-use drawings.	In progress, complete at latest by Aug 31, 2013
Main Waste Dump	Every quarter, monitor for movement the area of tension cracks at the south end of the MWRD	To be completed twice annually during summer months at end of Q2 and end of Q3 as part of site physical geotechnical inspections
Southwest Dump	Ponding water "prior to placement of next lift"*, re-grade to promote runoff.	Further investigation and design work to be completed by end of Q2 2013, mitigation measures to be completed by end of Q3 2013 as required
	Monitor for erosion at culvert outlet near W15 Detention Structure.	To be completed annually at end of Q2, while culvert is in service
	Repair liner and anchor system for W15 Detention Structure. Install barrier or berm to prevent further damage to liner.	Geosynthetic Clay Liner used to cover damaged areas of W15 liner during Sept 2012, rip rap was used to secure the repair in position
Reclamation Overburden Dump	Install a rip-rap channel down slope. Re-grade areas of existing erosion channels to direct runoff to rip-rap channel.	Further investigation and design work to be completed by end of Q2 2013, mitigation measures to be completed by end of Q3 2013 as required
	Monitor ponded water to ensure the offset from the dump toe is maintained, as stipulated in design report.	To be completed twice annually during summer months at end of Q2 and end of Q3 as part of site physical geotechnical inspections
	Survey toe of dump annually to ensure it is within permitted boundary	Survey at end of Q2 annually
Mill and Camp Site	Raise concrete barrier below mill area slope, or clean out behind barrier, to capture additional sloughing material.	Wall scaling completed in March 2013, verification that clean out of material has been completed to be conducted by end of March 2013
	Re-grade area of erosion rills below camp pad to direct runoff away from these areas. To adequately mitigate erosion, it may be necessary to Install a half culvert or rip-rap channel and construct a small ditch near the slope crest to direct water to the channel.	Monitor during spring 2013 freshet (April, May), develop mitigation plan to manage the water flow path in this area so as to prevent erosion by end of Q2, install mitigative measures by end of Q3 2013
Mill Water Pond	Re-establish survey hubs and collect monthly data until result are consistent. Monitor every 6 months thereafter.	To be completed as part of Ground Control Program, target date: end of Q2 2013
	Patch tears in liner. Fill in voids in material below tears prior to patching.	Mill water pond is no longer in service as mill water supply
	Monitor condition of liner beneath bypass pipe supports	Mill water pond is no longer in service as mill water supply
	Clean out accumulated sediments from run-off ponds and culverts	Mill water pond is used as a seasonal drainage collection area for mill site during spring melt, target completion date end Q2, 2013
South Diversion Ditch	Remove vegetation from ditch to increase flow capacity	Inspect at end of Q3 annually and complete, as required, to prepare for the next year's freshet
	Cover exposed liner as per channel design	Inspect at end of Q2 2013 and where exposed, cover liner
Water Storage Pond	Conduct monthly monitoring of survey hubs along dam crest, until results are consistent, then reduce frequency to every 6 months	Monitoring currently being conducted. Frequency to be reviewed as part of Ground Control Program, target date: end of Q2 2013
	Continue regular monitoring of the dam, specifically the flow and clarity/turbidity of seepage, and the seepage rate through the weir.	To be conducted monthly during summer months (Q2, Q3) and, at a minimum, quarterly during winter months (Q4, Q1), frequency to increase to daily should a change in turbidity be noticed or a significant, non-spring melt related, increase in flow
Big Creek Bridge	Continue annual monitoring of sediment accumulation in culverts, and clean them out if accumulation continues.	To be conducted at end of Q3 annually

8 Reclamation

Reclamation at Minto Mine during the reporting period progressed throughout the year. The current *Decommissioning and Reclamation Plan* (submitted in September 2011) has guided the reclamation projects on-site to date. The primary focus for reclamation and reclamation research for 2012 includes:

- Cover implementation;
- Cover design study;
- Soil characterization;
- Re-vegetation; and
- Passive water treatment trials.

The majority of the research mentioned above is described in detail in the *Reclamation Research Plan* which was submitted to the Yukon Water Board in November 2012 as per Clause 98 of the WUL. The information gathered from the progressive reclamation that has been completed to date will form the base knowledge for future closure planning.

8.1 2012 Progressive Reclamation Activities

2012 progressive reclamation efforts were primarily focused on a large scale re-vegetation cover trial of the Main Waste Dump (MWD) and the start of an overburden cover on the DSTSF.

8.1.1 Main Waste Dump Reclamation

Previous year's research has provided Minto Mine with information to pursue a large-scale project: the cover trial on the Main Waste Dump (MWD) re-contoured rock surface. Two variables were considered in the trial; the suitability of the major types of overburden found on-site as cover material and amendments such as fertilizer and organic material. These will be compared to simply seeding the overburden, allowing Minto Mine to gauge if these amendments improve seeding success. Re-vegetation success will be monitored and will provide Minto with information to customize site-specific reclamation methods. The cover trial will also stabilize inactive slopes, reduce the amount of reclamation taking place at end of mine life, and improve aesthetics on-site.

Ongoing data collection from the 2012 and 2013 growing season will provide Minto Mine with additional information, including:

- Assessing success of seed mix on large scale plots;
- Determining if different types of overburden on-site can support vegetation; and
- Gauging benefit of using amendments to overburden (organic matter and/or fertilizers).

Figure 8-1 shows the reclamation work that Minto Mine completed on the Main Waste Dump in 2011. At the beginning of the 2012 summer Minto completed the re-contouring of the slopes (Figure 8-2) and placed 1 m of overburden over the re-contoured slopes (Figure 8-3). As sections of the overburden were placed, they were hand seeded and fertilized (depending on plot amendment) (Figure 8-3).

Figure 8-1: Main Waste Dump near the end of construction season 2011 (September).

Figure 8-2: Main Waste Dump as it appeared in July 2012 with final placement of overburden into distinct plots.

Figure 8-3: Final plot placement in August 2012. Note seedling emergence in upper right plots.

To support further investigation into suitable cover materials required under Minto Mine's June 2011 *Decommissioning and Reclamation Plan*, materials were recovered from the site's Reclamation Overburden Dump, characterized, and placed in distinct plots (Figure 8-4). The naming convention of the overburden plots reflects the position the overburden was placed on the Main Waste Dump. There are two benched areas, identified as "Upper and Lower". West facing slopes and east facing slopes are also pointed out in the convention. Table 8-1 below indicates the naming convention for the plots, along with their areas.

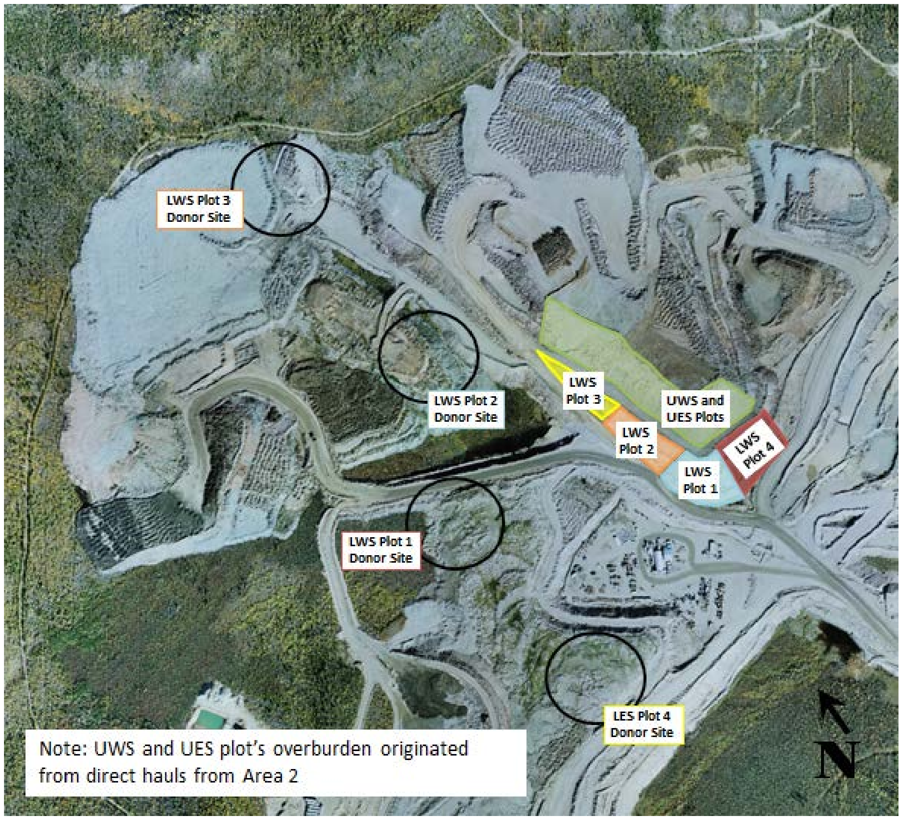

Figure 8-4: Origin of overburden material from Reclamation Overburden Dump placed in distinct plots on the Main Waste Dump re-contoured rock surface.

Table 8-1: Naming convention, areas, volumes and depths of each overburden plot.

			Area (m2)	Area (ha)	Depth of OVB cover (mm)	Total volume of material placed (m3)
Plot Name	Upper West Slope (UWS) and Upper East Slope (UES)	**UWS and UES Plots**	17229	1.72	1000	17229
	Lower West Slope (LWS)	**LWS Plot 1**	10309	1.03	1000	10309
		LWS Plot 2	6237	0.62	500	3118
		LWS Plot 3	6219	0.62	1000	6219
	Lower East Slope (LES)	**LES Plot 4**	3970	0.40	1000	3970

Plot size was chosen to balance the minimum area required to gather scientifically sound information, initiating enough diverse treatments to analyze different scenarios, and field fitting the plots for the most efficient use of space. Each overburden plot was chosen to represent materials available from the overburden stripping that occurred in Main Pit and Area 2 Pit. As displayed in Figure 8-1the upper slope plots were capped with material directly excavated and hauled from Area 2 Pit development indiscreetly, without much segregation. A selection method occurred for the lower slope's plots within the Reclamation Overburden Dump area. Sites were chosen to represent a wide range of materials on-site (gravelly and sandy overburden, to loam-textured, to overburden containing high clay content pockets). Stockpiles and pads of materials were surveyed for material types using field cues (hand texturing, colour comparison, visual estimation of coarse to fine material composition).

8.1.2 Dry Stack Tailings Storage Facility Cover

As required by Clause 37 of the WUL, Minto Mine started the construction of a trial cover to limit fugitive dust, erosion, and infiltration of precipitation, snow melt or run-on waster into the dry stack tailings. It is Minto Mines intention that if the cover is deemed suitable by the cover design study that the cover will change from a trial cover to permanent cover. The cover consists of roughly 1 m of overburden that was stripped from Area 118. Cover construction commenced November 2012 and will be completed in 2013.

8.2 Cover Design Study

Minto Mine acquired the services of SRK Consulting to evaluate a cover design using overburden from the Minto Mine site. During the reporting period the predominant focus with regards to the Cover Design Study was placed on determining the overburden quantity and characteristics. A total of forty-two samples were collected and sent to external labs for analysis. See Section 8.3 for further detail regarding overburden analysis.

8.3 Overburden Characterization

To formally characterize the overburden, composite samples were collected from each type of overburden represented within the five plot areas. Along with the composites of the overburden plots another thirty-seven samples were collected and sent to external labs for analysis. Thirty-five samples were sent to the EBA soils laboratory in Whitehorse for gradation, hydrometers and Atterberg limits. Seven selected samples were sent to Golder Associates Consulting in Saskatoon for gradation, hydrometers, Atterberg limits, moisture content, hydraulic conductivity testing, and soil water characteristic curve. The information obtained from the laboratory results will be used by SRK Consulting in performance prediction modeling of overburden covers.

8.4 Re-vegetation

As mention previously Minto Mine used the Main Waste Dump cover for vegetation plots using various combinations of amendments.

The seeding surface was prepared by lightly grading the surface with the blade of a CAT D-6 dozer. The light grading was key for the slopes that had overburden placed on them in 2011, this grading brought moisture to the surface and broke up the hard surface created by heavy snow pack over the winter of 2011/2012 (Figure 8-5). The dozer tracks running up and down the plot's surface, perpendicular to the slope, created microsites. These microbenches are capable of capturing moisture, seeds and fertilizer pellets in depressions (Figure 8-6).

Figure 8-5: Plot surface after grading with the D6 Cat dozer.

Figure 8-6: Close up of microbenches, depressions capture recent seeding.

Plots were designed to field fit 2 amendment applications along with 1 control area within each section of overburden plot. The layout of the plots is depicted in Figure 8-7. Plots were laid out initially by field fit and their final location was determined by Trimble GPS survey equipment to calculate area.

The amendment options are seed applied at a rate of 34 kg/hectares (ha) or 340 kg/ha, or seed and fertilizer applied at a rate of 34 kg/ha and 125 kg/ha, respectively, or seed and fertilizer applied at a rate of 340 kg/ha and 1250 kg/ha, respectively (refer to Figure 8-4 and Figure 8-7).

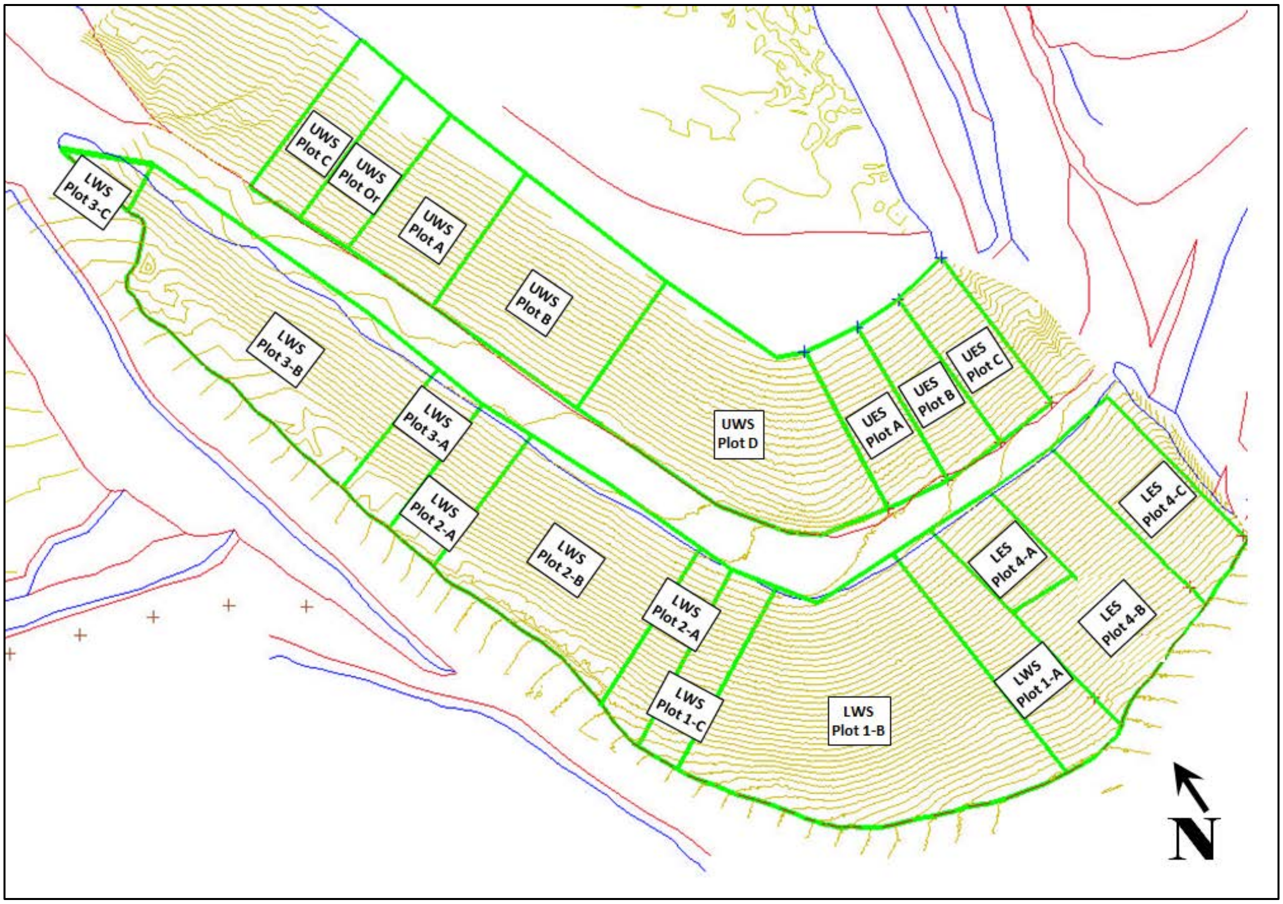

Figure 8-7: Diagram of Main Waste Dump re-contoured surface indicating locations of plots.

Table 8-2: MWD seed plot breakdown.

			Area (m2)	Area (ha)	Seeding Rate (kg/ha)	Seed Applied (kg)	Fertilizer Rate (kg/ha)	Fertilizer Applied (kg)	Organic Material Applied (m^2)	Date Seeded
Plot Name	Upper West Slope (UWS)	UWS Plot C	1200	0.12	-	-	-	-	-	-
		UWS Plot Or	1200	0.12	34	4.1	-	-	12	3-Jul-12
		UWS Plot A	2037	0.20	34	6.8	-	-	-	3-Jul-12
		UWS Plot B	3516	0.35	340	119	-	-	-	28-Jul-12
		UWS Plot D	5256	0.53	34	17.9	-	-	-	30-Jun-12 and 24-Aug-12
	Upper East Slope (UES)	UES Plot A	1260	0.13	340	44.2	1250	162.5	-	22-Jul-12
		UES Plot B	1140	0.11	340	37.4	-	-	-	23-Jul-12
		UES Plot C	1620	0.16	-	-	-	-	-	-
	Lower West Slope (LWS)	LWS Plot 3-C	6219	0.62	-	-	-	-	-	-
		LWS Plot 3-B	3470	0.35	34	11.8	-	-	-	22-Aug-12
		LWS Plot 3-A	910	0.09	34	3.1	125	11.4	-	22-Aug-12
		LWS Plot 2-C	1030	0.10	-	-	-	-	-	-
		LWS Plot 2-B	4540	0.45	37.3	12.9	-	-	-	23-Aug-12
		LWS Plot 2-A	1330	0.13	37.3	3.4	125	16.6	-	23-Aug-12
		LWS Plot 1-C	1200	0.12	-	-	-	-	-	-
		LWS Plot 1-B	6600	0.66	34	22.4	-	-	-	24-Aug-12
		LWS Plot 1-A	2500	0.25	34	8.5	125	31.25	-	23-Aug-12
	Lower East Slope (LES)	LES Plot 4-A	948	0.09	340	30.6	1250	22.5	-	26-Jun-12
		LES Plot 4-B	1069	0.11	340	37.4	-	-	-	27-Jun-12
		LES Plot 4-C	1953	0.20	-	-	-	-	-	-
		Total Area of Seeded Plots =	52968	5.30	Total Seed Used =	297.4	Total Fertilizer Used =	185		

A dry land seed mix optimized by Access Consulting in previous *Reclamation Research Reports* (2007, 2008, 2009, and 2010) was ordered from Pickseed Canada in Sherwood Park, Alberta. 20-22-12 fertilizer was ordered from a local supplier, Arctic Alpine Seeds in Whitehorse, Yukon.

Plots were seeded by hand. Seed was weighed out into each bag using pre-weighed containers, up to an accuracy of 0.1 kg for seed and 1 kg for fertilizer. The sections were divided into smaller sections for seeding, depending on how many seeders were available, to accommodate a maximum of ~13 kg per seeder. Rebar stakes were placed around the perimeter of the area to be seeded. One seeder calculated the prescribed seed and fertilizer application, based on seeding and fertilizer rate, and divided the seed evenly among seeders. Then, seeders walked perpendicularly along the slope, evenly spaced apart, taking care to throw seed as evenly as possible.

Success of seeding will be determined by estimating vegetation percent cover. This parameter will be used to compare establishment among the different overburden and amendment plots, giving an indication of which overburden can best support vegetation and whether amendments aid, hinder, or have no effect on establishing vegetation. Order of dominance will be recorded to optimize the dry land seed mix in the future, if necessary. If the chosen seed supplier does not have a specific species on hand, other species could be substituted or omitted if they are not seen in the plots within 1 to 2 years. List of volunteer species is recorded to identify plants that are present in the seedbed or recruiting from external sources. These species deserve consideration in future reclamation work as they are well suited to specific site conditions and are available in abundance around site.

8.5 Passive Water Treatment

Near the end of 2012 Minto Mine set up a passive water treatment study in the Main Pit pond. The passive water treatment study consists of four limnocorrals in the Main Pit pond, with various applications applied to each limnocorral. The four limnocorrals have been setup for a test of in-pit treatment of nitrate, selenium (as selenite/selenite), and to evaluate the effects on other metals in the water column. The treatment method for the removal of these constituents is biological reduction, where nitrate is reduced to nitrogen (gas), selenium (as selenite/selenite) is reduced to elemental selenium (solid). In the higher doses of electron donors, sulfate reduction is also expected; in this case, some metals may be removed as sulphide precipitates.

The limnocorral study is part of an ongoing program to evaluate the feasibility of passive treatment at the Minto Mine, and the results of this study will be used to design possible larger scale trials in the pond and/or will inform other potential passive treatment studies at the site.

Limnocorrals were filled with pit water and a baseline sample was removed to measure baseline chemistry. Field parameters and constituents required to be measured for discharge under the WUL will be measured to provide a baseline. Microbial abundance measurements will also be taken at the baseline. The calculated volume of the limnocorrals is 3 m in diameter by 10 m deep or 70.65 cubic meters (m^3). A dye or salt tracer will be added at the same concentration to each limnocorral to demonstrate the integrity of the limnocorral with respect to leakage to the surrounding pit water.

Sediment from the Water Storage Pond was added once the limnocorrals were filled; as well the carbon sources were added to the water column through a recirculation pump.

The primary test variable evaluated in this program is the concentration of dissolved organic carbon on reductive reactions. The liquid source of organic carbon is molasses and the alcohol used is ethanol. The secondary variable evaluated is the addition of a solid phase organic carbon and surface attachment source, wood chips, on the development of reducing conditions and treatment effectiveness. The volume of wood chips used was approximately 1 m^3 per limnocorral. Sediment from the edge of the Water Storage Pond was used as a microbial inoculum, as the preliminary work done in 2008 showed denitrification and selenite reduction effects was achieved by adding a carbon source to this pond, indicating microbes capable of these reactions are present in the Water Storage Pond. See Table 8-3 for limnocorral summary.

Table 8-3: Limnocorral amendment applications.

Test Limnocorral	Inoculum (site sediment)	Molasses/Alcohol	Wood Chips
Control	Yes	No	No
Low carbon with surface area	Yes	40 mg/L each	Yes
High carbon	Yes	120 mg/L each	no
High carbon with surface area	Yes	120 mg/L each	yes

8.6 Ongoing Reclamation

Looking forward to 2013, Minto Mine will continue with progressive reclamation. Areas of focus for 2013 will be the DSTSF cover, old gravel borrow (17 km on the mine access road), rehab of camp slopes (erosion control), rehab and vegetation of cut bank at 0.5 km on the mine access road.

Along with the aforementioned reclamation projects, Minto Mine will continue on with various reclamation research programs including the cover design study, cover trial, passive water treatment, and biological reactor test pilot plant.

9 Water Management and Water Balance

The water balance for the Minto Mine forms the basis of the water management strategy. Conveyance structures divert and release clean surface water and direct impacted water to the Main Pit and eventually treatment.

The Minto Mine generally has a positive water balance, meaning that the site-wide annual runoff is greater than the volume of water required to operate the mine. Therefore, it is necessary to release water to Minto Creek.

Diversion and release of clean surface runoff is the preferred method for managing the site's water inventory.

In the event surface runoff does not meet the discharge limits stipulated in the WUL, Minto Mine has the ability to treat and release water using a combination of active treatment, conveyance and water storage features.

The following sections will summarize water treatment, conveyance and storage during the year from each water source.

9.1 Water treatment

All surface runoff that did not meet the WUL discharge standards was directed to the Main Pit through the W15 Pipeline, W35 (South Diversion Ditch), or via the W36 (MCDS) pump back.

Minto has the option of treating for:

- Total suspended solids (TSS) only: clarification;
- TSS, copper and cadmium: clarification and chemical precipitation, or
- All water quality parameters present in the Main Pit: clarification and reverse osmosis (RO).

Water treatment by-products including TSS sludge and RO reject was be pumped back the Main Pit.

9.1.1 New Reverse Osmosis Treatment Units

WUL QZ96-006 (amendment 7) requirements came into effect which set discharge limits for selenium and nitrate. In 2012, Minto Mine addressed the amendment 7 WUL requirements, by modifying the water treatment plant to integrate a reverse osmosis (RO) module, two trains of 128 elements capable of over 250 m^3 per hour through put. With the RO module integrated, the purpose of the original ChemSulphide® plant also changed. In effect, the original plant now provided pre-treatment of feed to the reverse osmosis (RO) modules.

The RO modules, through high pressure feed pumps and nano-filtration, forces the saline product through the membranes (series of filtration elements) while rejecting the dissolved ions, including metals and nutrients. In 2012, the system typically performed at 80% rejection efficiency. The RO module arrived on-site on April 1st, and installation and tie-in was completed by April 19th. Pure Aqua's (RO unit supplier) commissioning of the RO units took place from April 16th –April 23rd. The plant and RO integration and optimization tests continued until the plant began discharging to the Water Storage Pond on May 11th.

9.1.2 Operations Overview

The water treatment system operated for 36 days, and treated 104,055 m^3 of water during the 2012 season. Operations were suspended on June 15th, once the Water Storage Pond reached a conservative capacity. Table 9-1, below, presents a water treatment operations summary for the 2012 season.

Table 9-1: 2012 Water treatment operations summary.

Constituent		Water Use Licence Limit (mg/L)	Average Discharge Quality (mg/L)
Water Treated Number of Operating Days	104,055 m^3 36		
Ammonia		0.89	0.07
Nitrite		0.120	0.01
Nitrate		7.65	1.7
Total Copper		0.050	0.002
Total Aluminum		2.70	0.09
Total Cadmium		0.00015	0.00012
Total Selenium		0.0030	0.0007

9.2 Water Storage and Conveyance Network

The water conveyance network as previously described operates on the principal of keeping clean water clean while focusing on the treatment of contaminated streams in an effort to minimize the volumes of water treated and to maintain natural flow regimes. This pro-active approach to water management is preventative and operates under the principal of continuous improvement. Many engineered structures were proposed for the 2012 operating season and were developed operationally however there are many activities that were pushed forward to 2013.

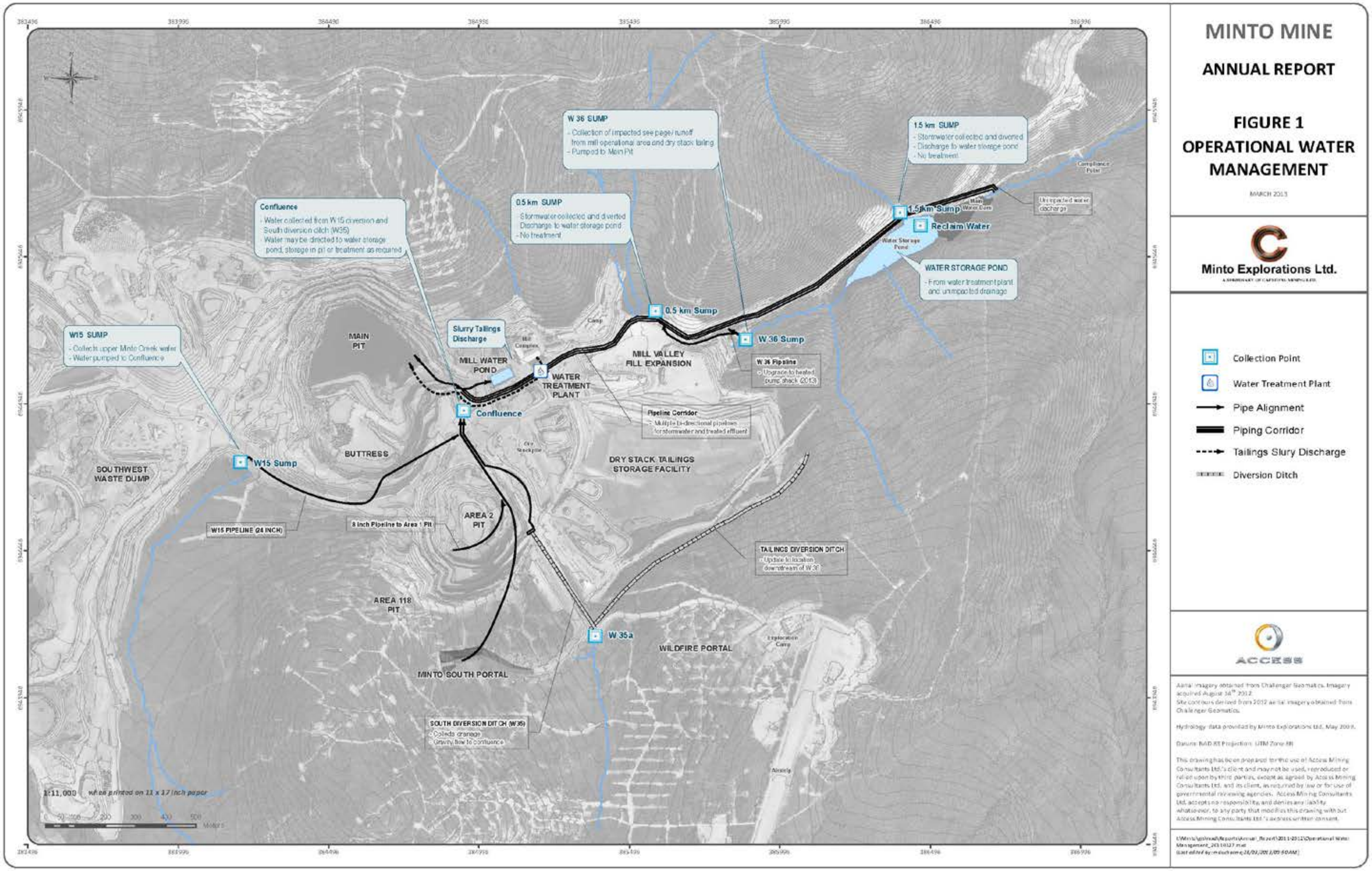

Figure 9-1: Minto Mine 2012 water conveyance network.

9.2.1 Water Conveyance Construction

2012 South Diversion Ditch Construction

In 2012, the South Diversion Ditch (SDD) was temporarily modified to route flow around the footprint of the Area 2 Pit. Prior to the 2012 pushback of the Area 2 Pit, the South Diversion Ditch collected water from the southern portion of the upper Minto Creek catchment and diverted it around the west side of the Dry Stack Tailings Facility (DSTF). Mine development planned for 2012 encroached upon the ditch and required realignment of the northern portion of the SDD in advance of the pushback. Minto identified design criteria for the SDD realignment:

- Maintain the routing of water to the confluence area;
- Realign the water conveyance around the Area 2 Open Pit;
- Overflows were to be directed towards the Area 2 Open Pit;
- Pipe alignment to begin as close to the Area 2 Open Pit as possible;
- Minimize seepage at the pipe inlet;
- A maximum pipe grade of 2.2% was to be used; and,
- A 24" DR 11 pipe was to be used, to allow tie in with the existing piping network.

In advance of the 2012 freshet a temporary structure that conveyed run on water was built with the following amendments to the initial design:

- The 24" HDPE pipe, was substituted using two 16" pipes
- No overflow was designed; instead it was planned to actively manage any excess water volume via pumping.

The ditch and piping performed adequately during the 2012 spring melt and summer season; no flows were encountered during the winter season. Permanent upgrades/modifications will be undertaken in early 2013 in accordance to designs by SRK Consulting Ltd. (submitted to YWB in 2013). See Figure 9-2 for ditch and pipeline alignment.

Figure 9-2: South Diversion Ditch (September, 2012).

2012 Minto Creek Detention Structure Construction

In 2012 upgrades were made to the existing MCDS. Firstly; the slumping detention structure was repaired by excavating a portion of the structure where settlement had been observed, using compacted lifts of residuum and geotextile. Following this, a geo-synthetic clay liner was installed to replace a torn HDPE liner; fully encapsulating the detention structure face, the sump and surge pond. The surge pond capacity was re-established and can retain approximately 600 m^3 of water (Figure 9-3). Additional upgrades are proposed for the 2013 season to winterize the facility and provide year round pump back to the Main Pit.

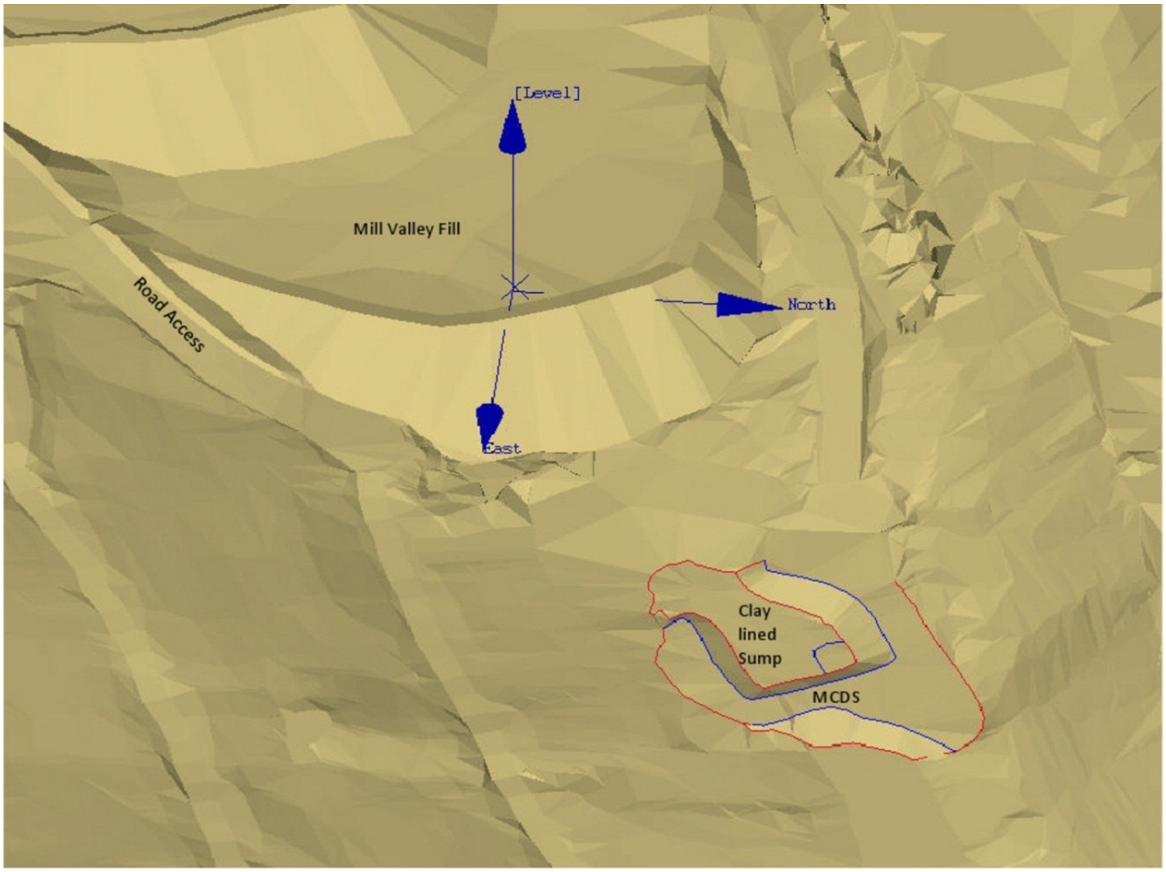

Figure 9-3: Total scan showing the Minto Creek Detention Structure (March, 2012).

9.2.2 Pipelines and Ditches

Diversion of W35A water (South Diversion Ditch): Water was diverted from the southwest catchment (collected at station W35A) to the Water Storage Pond. This catchment measures approximately 200 ha and thus represents about 20% of the total catchment for the Minto Mine. Historically, the water at W35A has been of a similar quality to undisturbed surface runoff measured at catchments outside of the Minto Mine. Therefore, the diverted water is unlikely to compromise the water quality in the Water Storage Pond. On-going water quality monitoring will ensure that water in the Water Storage Pond remains in compliance with discharge standards in effect. An estimated total of 260,000 m^3 was moved through this structure in 2012 (Table 9-2).

Diversion of W15 water: Water collected at W15 collects surface runoff from undisturbed areas and from waste rock. The total catchment measures between 250 and 300 ha and thus represents between 25% and 30% of the total catchment for the Minto Mine. The water quality parameter concentrations have historically been elevated compared to undisturbed catchments but have in many instances been below discharge standards for the majority of parameters. On-going water quality monitoring will ensure that water diverted from W15 and water in the Water Storage Pond remains in compliance with discharge standards in effect. A total of 275,000 $m^3$was moved through this structure in 2012 (Table 9-2).

Pump Back of W36 water (Minto Creek Detention Structure): Water collected downstream of the mill area, ore stockpiles and DSTSF is pumped back to the Main Pit for treatment. The water quality parameter concentrations have historically been elevated compared to other sites on the property. This structure is essential to maintain water quality in the Water Storage Pond and is a key component of the water conveyance network. On-going water quality monitoring ensures that trends in quality and quantity are tracked. A total of 111,000 $m^3$was pumped back to the Main Pit from the MCDS in 2012 (Table 9-2).

9.2.3 Water Storage Locations

Main Pit: The Main Pit was used as a reservoir to support water use for the Mill process and in addition was used to collect impacted runoff and supply feed water to the water treatment plant. Water quality dictates that all water reporting to this location must undergo treatment prior to discharge. A total of 615,000 m^3 of water reported to the Main Pit in 2012 and 104,000 $m^3$was treated and discharged via the Water Storage Pond. 185,000 $m^3$of this water was tied up in dry stack tails or in slurry tails (Table 9-3 and Figure 9-4).

Water Storage Pond: The Water Storage Pond worked effectively as a storage location for un-impacted water and maintaining water quality below discharge criteria. In 2012, no water was pumped back to the Main Pit in advance of freshet due to better planning and improved infrastructure. A total of 154,000 m^3 was pumped up to the mill for process water and 171,000 m^3 was discharged offsite. 104,000 m^3 was added to the Water Storage Pond from the Main Pit via the Water Treatment Plant (Table 9-3 and Figure 9-5).

9.2.4 Volumes and Tracking

Table 9-2: Estimate of m³ moved by conveyance structure based on flow meter and pump log data.

2012 Flow meter/Manual Flow	Water m^3 moved to Water Storage Pond	Water m^3 moved to Main Pit	Total m^3 moved
W35**	103772	155658	259429
W15	109667	164500	274167
W36		111390	111390
Total	**213438**	**320158**	**533596**

****extrapolated from W15 data**

Table 9-3: Total site surface runoff breakdown (Adapted from the Water Balance Update).

Inputs	Units	Quantities	Quantities
Pit Volume Increase 2012 (754.4 m to 765.1 m Level)	m^3	800,000	
Tailings to Main Pit, total	BCM	85,000	
PAG, deposited sub-aqueously in Main Pit	BCM	100,000	
Main Pit Water Volume Increase 2012	m^3		615,000
Water Storage Pond **Net Water Volume Increase 2012**	m^3		-19,000
Water stored in DSTSF tailings	m^3		150,000
Water Discharged to Minto Creek in 2012	m^3		170,000
Total Surface Runoff Above Water Storage Pond **in 2012**	$\mathbf{m^3}$		**~920,000**

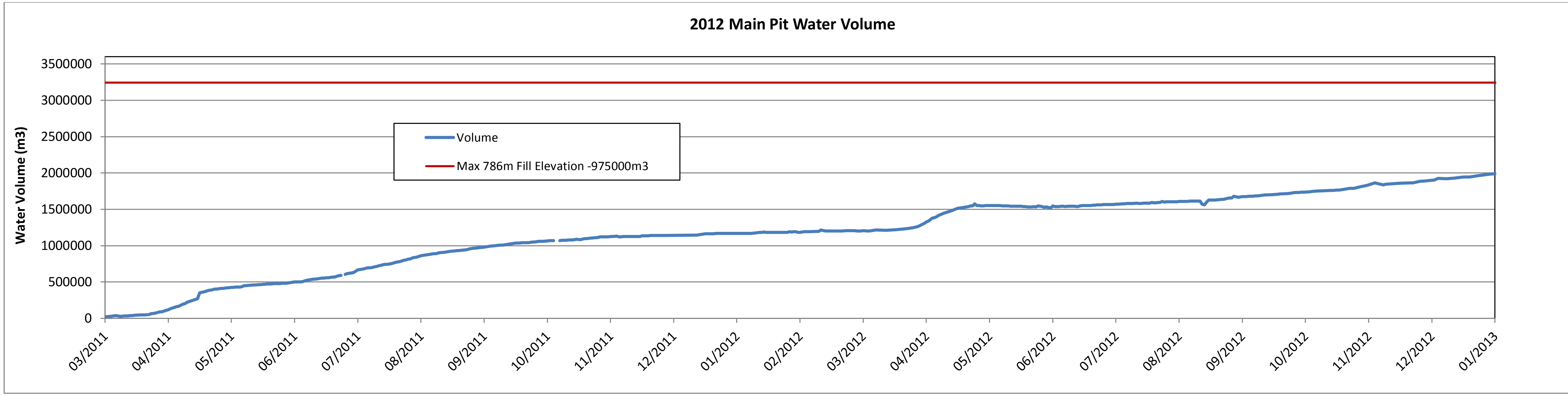

Figure 9-4: Main Pit water volume for 2012.

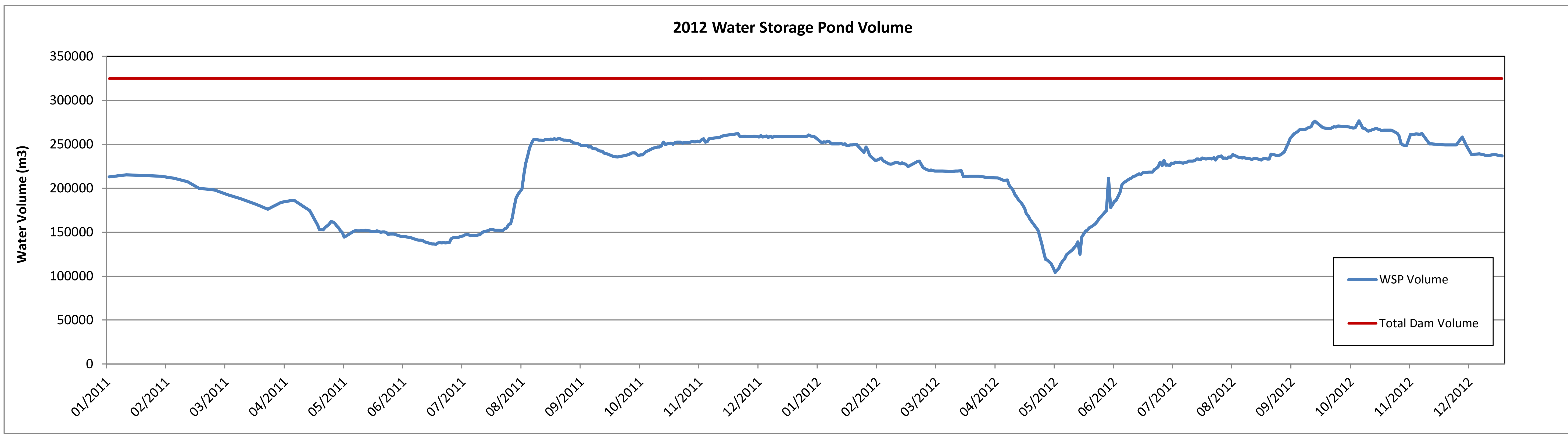

Figure 9-5: Water Storage Pond water volume for 2012.

9.3 Water Balance and Water Quality Predictions Modeling

In partial fulfillment of the Water Balance and Water Quality Model as required under Clause 78 of the WUL), Minto Mine retained SRK Consulting to complete a 2012 site water balance and water quality prediction update. Refer to Appendix J for details on the 2012 Minto Mine water balance and water quality prediction update.

10 Closure

We trust this document fulfills your present requirements. If you have any questions or require further details, please contact the undersigned.

Prepared by:

Minto Exploration Ltd.

Minto Mine